Is it too easy to be green?
A Comparative Analysis and Critical Assessment of Green Building Rating Systems

An Honors Thesis (HONR 499)

by

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Abstract

With a continued emphasis on designing for sustainability in architecture, it is important to see what role green rating systems are playing and what differences they are making. There are many options when it comes to choosing a green rating system for a particular project, and their metrics can vary greatly. Names such as LEED and BREEAM have a large global presence and a long standing relationship with green design. Others, like the Living Building Challenge, are pushing criteria to higher standards.

By examining popular green rating systems, one can get a better idea of their fundamentals – what concepts each system evaluates and emphasizes. Comparatively analyzing specific projects certified under these various rating systems then reveals how such systems manifest themselves in the built environment. Finally, cross-referencing this data with practicing academic and professional subjects' views helps to formulate a clearer image of what implications green rating systems are having today and what their continued role may be in the future of architectural design.

Acknowledgements

We would like to thank Professor Robert Koester for his efforts in advising us throughout this process. We would also like to acknowledge the individuals who donated their time and knowledge during this course, including all of our interview participants.

This was a team project with equal contributions from both parties. I, Emily Newton, wrote the first drafts for Living Building Challenge, Green Globes, and BREEAM. I also completed the first drafts of the Living Building Challenge and BREEAM case studies. I transcribed interviews from Olon Dotson, James Kerestes, Daniel Overbey, and Rod Underwood. All interviews, editing, and analysis writing were done simultaneously as a team.

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Introduction

After taking a design studio with Professor Robert Koester focused on the design of a green technology center and seeing his passion for sustainable design practices, we were intrigued when he presented us the opportunity to explore green rating systems for our thesis. These systems – most notably LEED – are a topic that we touched on in several courses, including environmental systems and building technology but never explored beyond a basic introduction. In preparation to write an in-depth analysis, we took immediate steps to immerse ourselves in the field of designing for sustainability. As a team we explored and examined different aspects of the green movement by enrolling in a semester-long course, "Sustainability in our Built Environment", and traveling to other universities to hear speeches and see presentations by some of the industry's leading professionals, such as Bob Berkebile in his keynote address at the Ecological Sciences and Engineering Summit 2013.[1]

After gaining some basic knowledge we felt confident in selecting the specific green rating systems and green initiatives that were to be analyzed and used for the basis of our opinions. The five systems we selected were Leadership in Energy and Environmental Design, or LEED, because it is the foremost used in the United States; Building Research Establishment Environmental Assessment Methodology, or BREEAM, because it is the longest-established and most widely used at the global scale; Green Globes was chosen as an American counterpart to LEED; the Living Building Challenge because it is one of the most stringent in its standards; and the Architecture 2030 initiative because it is one of the most concise, yet ambitious plans for lowering future carbon emissions.

The following research and analysis should not be considered a complete analysis of the field of sustainable design, rather a selective look at some of the major contributors and the values behind their actions. They are samples of a broader picture that is quickly moving beyond the field of architecture into areas such as social justice and environmental equity. It should be noted that as architecture students, we chose to focus almost solely on newly-constructed buildings, rather than the larger community-scaled projects or rehabilitations. It is our goal that this analysis be used as an informational tool and starting point for readers to form their own opinions about the evolving market, as well as serving as a catalyst for conversation about the importance of designing for the future and protecting the environment.

Perhaps one of the first persons to look at green design scoring systems was Malcolm Wells in 1969. His approach was simple; it contrasted the two extremes: the

wilderness and a suburban research lab. Under Wells' score sheet the wilderness would attain a perfect score of 1500 while the suburban research lab would achieve a negative score. The system he developed encompassed a broad spectrum of qualities involved in the building process. During the summer of 1999 it was revised and expanded upon by the Society of Building Science Educators. Items on the list include concepts such as rainwater usage, solar harvesting, soil preservation, and beauty.[2] Although these topics were not quantitative on Wells' list, many of them can now be found in more elaborate checklist systems such as LEED and BREEAM.

Image 1: Wells' score sheet

Our research is focused on building-scale rating systems. Although rating systems such as BREEAM or Green Globes consider the many components that make up a building, the systems' final rating is of the building as a holistic unit. The individual components, materials, and systems do not receive their own rating. Many tools do exist, however, that quantify performance standards of such mechanisms. For example, the United States Department of Energy, Energy Efficiency & Renewable Energy (USDOE EERE) has indexed well over 400 software programs that calculate the performance of building systems and components. These software packages can be a resource designers use to test building mechanisms prior to construction for optimal efficiency. They also can be great tools to test systems in order to achieve the standards of a particular green rating system.[3] These packages however fall outside of our study.

In the following pages we describe in more detail a combination of five rating systems and green initiatives, as well as related case studies.

Introduced by the United States Green Building Council (USGBC) in 1998, Leadership in Energy and Environmental Design (LEED) is an agenda set to help drive our built environment in a more sustainable direction. The USGBC is a nonprofit organization devoted to shifting our nation into a sustainable future through cost-efficient and energy-conscientious buildings. Their leadership initiative is described as "a framework designed for building owners and operators to be able to identify and implement practical and measurable green building designs, construction methods, operations, and maintenance solutions." The USGBC prides itself on being one of the only organizations to have created a program that grows and becomes progressively more difficult over time. LEED is currently in its fourth version since its founding, LEED v. 4.[4]

The LEED project rating system is built upon a series of categories that contain both prerequisites and credits. The categories and their subdivisions are equated to a point system that tallies for the overall certification level. Prerequisites are the required elements, or green building strategies that must be included in any LEED certified project. Credits are optional elements or strategies that projects can elect to pursue to gain points toward LEED certification. The idea behind having both mandated and optional points is to create a rigorous but adaptable system that can accommodate many project types. The LEED system generally has 100 base points, 6 Innovation in Design points, and 4 Regional Priority points, for a total of 110 available points. LEED for Homes, however, uses a 125 base point scale with 11 Innovation in Design points, for a total of 136 points. Point totals earn four distinct ratings granted by LEED:

-Certified: 40-49 points
-Silver: 50-59 points
-Gold: 60-79 points
-Platinum: 80+ points[5]

There are five main categories to accumulate points for LEED certification: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality. For specific projects, including the homes category, additional or specialized points may become available. These can range from neighborhood planning to green

infrastructure. The other two areas previously mentioned in which points may be achieved are Innovation in Design and Regional Priority credits. Innovation in Design credits address sustainable building expertise as well as design measures not covered under the five LEED credit categories; in essence, they are awarded for projects going above and beyond the mandated scorecard. Regional Priority credits stress environmental priorities for buildings in different geographic regions. The Regional Priority credits are an attempt by LEED to make the rating system broad enough to work anywhere, yet attentive to the importance of localized design.[6]

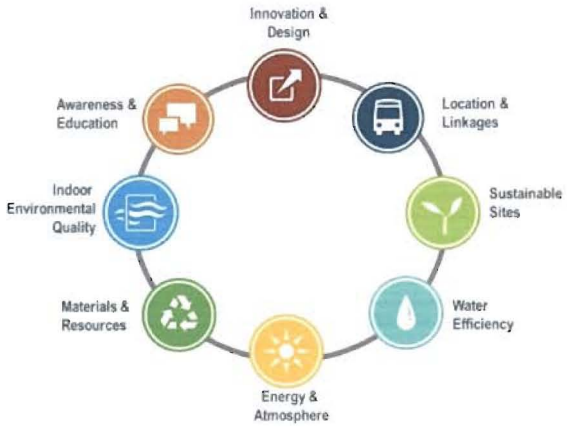


Image 3: LEED categories for rating

The LEED rating system is designed to be flexible enough to accommodate nearly any project type; including commercial, residential, and even full neighborhoods. The point systems set forth are currently pertinent to new construction, major renovation, core and shell, schools, retail, healthcare, commercial interiors, existing buildings (operations and maintenance), homes, and neighborhood development. A continued staple of the LEED rating is its ability to adapt throughout the entire building lifecycle, not simply new construction. Certifications are offered for phases including design and construction, operations and maintenance, tenant fitout, and significant retrofit. Regardless of the project types addressed above, the certification process of any LEED pursuant is the same. A third-party commissioner of LEED is responsible for granting certification for all projects. The Green Building Certification Institute's job is to perform the technical reviews and verifications of all LEED registered projects. It is this third-party that ultimately determines if projects meet the standards posed by the LEED rating system.[6]

A major concern in green design is the idea of post-occupancy evaluations of projects, or making sure projects live up to expectations. Once a project is awarded LEED certification at any level, it is not required to comply with standards associated with that level of certification should LEED change its standards. For example, LEED is currently in its fourth version since its founding, but projects that achieved platinum certification under LEED version 1.0 are not expected to comply with platinum standards of version 3.0. Although specific performance standards are not set for years after project certification, LEED standards are

designed to promote continued energy efficiency and high performance levels once certification is complete. To push this idea further, LEED developed the Existing Buildings: Operations & Maintenance Rating System. It is designed to act as a guide for continued building performance for both prior LEED projects and previously unaffiliated projects. It focuses on measuring building performance through data collected in the categories of energy, water use, occupant transit, waste recycling, fresh air delivery, and operational processes like green cleaning and site management.[7]

In addition to the certification of built projects, LEED offers the opportunity for professionals in the industry to become accredited in the green building process. LEED's professional credentials program is a chance for those concerned with design for sustainability and LEED's initiative to prove their dedication and knowledge on the subject matter. There are three levels of professional credentials: LEED Green Associates (GA), LEED Accredited Professionals (AP) with specialty, and LEED Fellow. LEED Green Associates meet the core understanding requirements of what it means to design for sustainability in conjunction with LEED. The next level of accreditation, LEED-AP, is reserved for those with an advanced knowledge of green design methods and the LEED process. LEED-AP status is also contingent upon one achieving an expertise in one of the specific LEED rating system categories. Finally, a LEED Fellow is a title reserved for those with outstanding and exceptional achievements in the pursuit of design for sustainability. LEED Green Associates attain their title upon completion of basic examination, while LEED-APs must pass a more challenging examination and sustain a continued education process. The LEED Fellow title is only possible after receiving LEED-AP status, satisfying a nomination process, and sustained work in the field of green design.[8]

With so much emphasis on green and sustainable practices throughout projects, one must also look at the financial implications of LEED. The USGBC and LEED do not directly mandate any price or cost analyses of projects; however, many third-parties have researched the cost of LEED projects. A recent study by the National Resources Defense Council showed that the total cost of building a typical LEED certified project was an average of 2 percent higher in upfront costs than a non-LEED project. Consequently noted was how operational costs, lease rates, rental premiums, and overall market value quickly negate the 2 percent price difference. The study, *Costing Green: A Comprehensive Cost Database and Budgeting Methodology*[9] measured the square-foot construction costs of 61 buildings seeking certification under the LEED rating system in comparison to buildings of

similar types that did not aim for sustainability whatsoever. Taking into account elements such as climate, location, market conditions and local standards, the study found that for many of the green projects, pursuing LEED certification had little effect on the total budget.[10] Also worth noting is the actual cost to certify a project through LEED. The USGBC estimates the average project to cost a minimum of $900 USD to register and an additional minimum of $2,250 USD to certify.[11]

LEED projects have proven to have many budgetary implications post-construction. In a 2011 study of the U.S. General Services Administration's LEED-certified buildings, the Department of Energy found LEED-certified buildings to have 25 percent lower energy use compared to the national average. This equated to reduced operational costs by 19 percent, comparatively. A recent study of PNC's bank branches by the University of Notre Dame found that the annual utilities cost per employee in their LEED facilities was $675.26 USD lower than in non-green facilities.[11]

Since its debut well over a decade ago, LEED's presence in the built environment has not gone unnoticed. Although started in the United States, LEED's role has expanded to a global scale. By the end of 2012 it was approximated that 40 percent of LEED projects were occurring outside of the United States and that certified projects existed in more than 140 countries and territories worldwide. The USGBC estimates there are 10.4 billion square feet of building space currently participating in the LEED rating system, and this is backed by 1.5 million square feet certifying per day globally. Numbers such as these indicate that LEED is one of the most popular and recognizable names in the green design movement.[4] Nonetheless, no system comes without its critics. Four states (Alabama, Georgia, Maine, and Mississippi) in the United States have gone as far as banning the rating system for new public projects. Such opposition has been contributed to by the petitioning from large material and building manufacturing companies.[12] Many of the reasons for such bans have been an integral part in the planning of the newest LEED system.

BREEAM®

While LEED is the most widely used rating system in the United States, it is not the most popular in the world. The Building Research Establishment Environmental Assessment Methodology (BREEAM) is the longest established rating system and far surpasses the number of LEED certified buildings with over 250,000 completed projects and over one million buildings awaiting certification. The assessment tool is most prevalent in the United Kingdom but has registered projects in more than 50 countries across the globe.[13]

Image 5: Countries with BREEAM projects

The rating system was established in 1988 and launched in1990 by the Building Research Establishment (once a government organization but now privatized) to assess newly-constructed office buildings. The first version was quickly followed by standards for superstores, industrial units, and existing offices.

Upon the release of LEED in 1998, there was a major overhaul of the BREEAM offices standard and the rating system layout, which was altered to weigh different sustainability issues. A second extensive update occurred in 2008, requiring mandatory post-occupancy evaluations, updated minimum standards, and the inclusion of innovation points. 2008 was also the year that BREEAM was launched internationally. This standard was annually updated through 2011 when a third major update occurred, resulting in the launch of BREEAM New Construction, which is currently used to certify all new buildings in the United Kingdom. There is another updated installment of BREEAM Standard expected to be released in 2014.[14]

The BREEAM rating system is measured in a number of categories including energy use, water consumption, health and wellbeing, pollution, transport, materials, waste, ecology, and management processes. Each of these areas has a base numeric total and a weighted score total that determines certification. Like LEED, BREEAM has a tiered rating scale. There are five levels:

-Pass: 30-44.9%
-Good: 45-54.9%
-Very Good: 55-69.9%
-Excellent: 70-84.9%
-Outstanding: 85%+[15]

There are also five BREEAM standards tailored to meet most building types and locations. The primary standard is BREEAM New Construction. It is used to asses all new, non-residential projects in the United Kingdom. International New Construction is a similarly-scored standard that extends to all projects outside of the United Kingdom and includes residential work in BREEAM certification countires. It accounts for circumstances, priorities, and codes of the specific locations the new location is built. BREEAM In-Use is a scheme designed to reduce the operating costs and reduce the environmental impact of occupied buildings, while BREEAM Refurbishment is for sustainable housing refurbishments. Finally, BREEAM Communities is a scheme targeted at improving an entire community. Its goal is to improve the environmental and economic implications of larger scale projects.

As the largest and most widespread rating system in the world, BREEAM has established several country-specific schemes, including programs in the Netherlands, Spain, Norway, Sweden, Germany, Austria, Switzerland, and Luxembourg. These schemes are all based on the original BREEAM scoring system but have been modified to meet all building performance standard codes of the respective nations, as well as to consider the climate, economy, and environmental benchmarks deemed necessary.

BREEAM has two certification levels for individuals, Assessor and Accredited Professional. Assessor is the lower-rated of the two and requires minimal training of a three day session and subsequent test. After passing, individuals may work on any BREEAM scheme. BREEAM Accredited Professionals are experts on built-environment sustainability with specialty knowledge. Their role is to aid the design teams and provide expert advice. Accredited Professionals are also supposed to schedule activities, set design priorities, and negotiate trade-offs required to meet the goal rating. Individuals receive extra training and testing to meet this qualification.[14]

The number of BREEAM project registrations has nearly doubled since 2008 when it expanded internationally. This growing trend indicates that BREEAM will continue to hold the European market for quite some time, especially the United Kingdom, as a majority of the registered projects are located there. With more than 450 million square feet of BREEAM accredited projects internationally and multiple countries forming their own National Scheme Operators, its hold is not likely to be challenged in the foreseeable future.

One of LEED's biggest North American competitors in the green rating systems market is Green Globes. Developed in Canada between 1996 and 2002, Green Globes was modeled using BREEAM as a starting point. The rating system was briefly only accessible in Canada before the nonprofit organization Green Building Initiative (GBI), headquartered out of Portland, Oregon, acquired in 2004 the license to continue development and distribution in the United States.[16]

Image 7: GBI logo

Scoring for Green Globes is based on a 1000-point system. The points are broken down into seven weighted categories for new construction that are in descending order: Energy (390), Indoor Environment (160), Resources, Building Materials and Solid Waste (125), Site (115), Water (110), Project Management-Policies and Practices (50), and Emissions, Effluents and other Impacts (50). Point totals lead to different designation levels for certification.

-One Globe: 35-54 percent
-Two Globes: 55-69 percent
-Three Globes: 70-84 percent
-Four Globes: 85-100 percent[17]

Points can be attained from any of the categories to meet the prescriptive percentages. As different projects may call for a different number of total points, percentages were chosen as the benchmarks. In certain cases local codes do not allow for actions, such as on-site wastewater treatment, so that category of points is deducted from the overall total at no penalty to the team. At each level there is a diminishing number of accredited projects. Less than one percent of rated projects have attained a Four Globe rating.

Unlike LEED, Green Globes has no prerequisites and only a few eligibility criteria. This was a calculated move meant to ensure that a wide variety of projects and building types would be able to undergo assessment. There are only four standards that every building must meet. To be considered buildings must score at least 35 percent of the total applicable points in a preliminary self-evaluation. They must attain a minimum percentage of points in each of the assessment areas. Projects cannot have been occupied for more than 18 months at the time the

assessment is ordered. Finally, all eligible buildings must be at least 400 gross square feet in size.[18]

Green Globes is also dissimilar to LEED in that it does not require a certified professional to work on the building. Clients desiring a Green Globes Professional (GGP) are welcome to integrate one from the onset of their projects, but the goal of Green Globes is to "be practical, user-friendly, and affordable with the goal of ensuring that architects, engineers, property managers, and building owners [can] use it directly." The system is entirely online and uses a simple checklist for determining project qualifications. Architects and contractors fill out an online questionnaire that gives advice for meeting specific benchmarks. This process is done multiple times throughout the project, replacing the need for a costly human consultant.

This is a major cost reduction and allows for the typical Green Globes building certification process to range from $10,000 USD to $12,000 USD.[19]

Green Globes is not without its critics. One of the biggest questions about the system is its lack of focus on green building materials. Inquiries have been raised in the past speculating that several building manufacturers and timber industry stakeholders serve (or have previously) served on the Green Building Initiative's board.[20] This noted conflict of interests has led many to question the integrity of the system, although many still consider it a valid and viable option, especially when compared to LEED. By early 2014, the General Services Administration approved Green Globes as an alternative to LEED for new construction. This was not the only major advancement that year. The Green Building Institute found a new president in Jerry Yudelson, PE, MBA. Yudelson is a LEED fellow and has been widely admired in the green building industry. His addition to the organization is expected to bring credibility and an ambitious overhaul to questionable portions of the system.

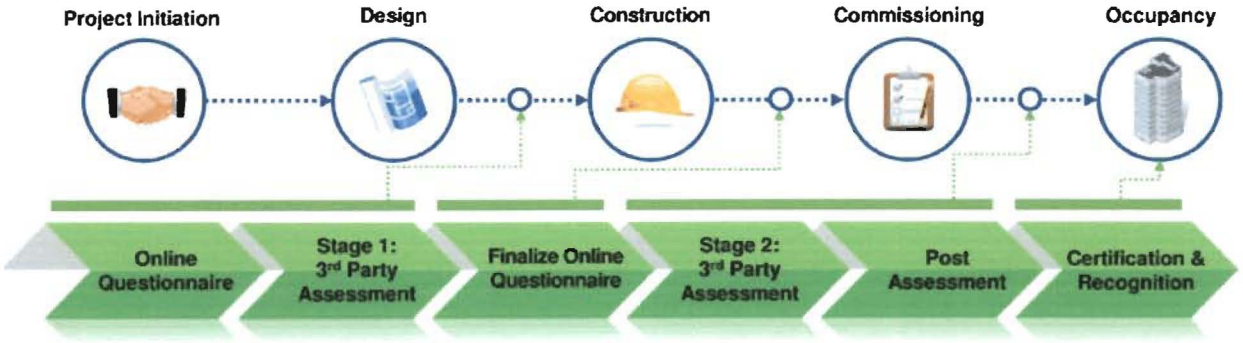
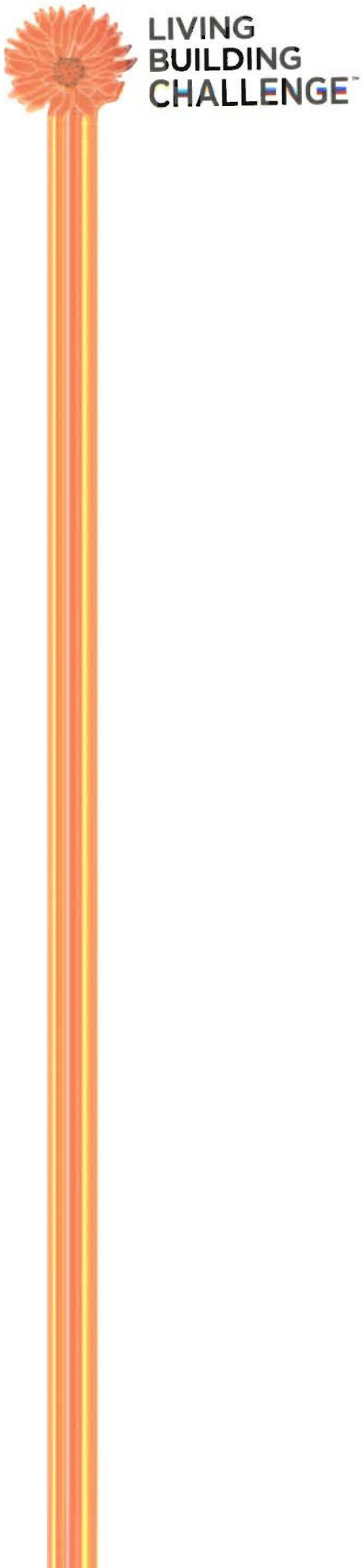


Image 8: Process for Green Globes certification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While LEED remains the most popular and fastest growing green rating system nationally and BREEAM is dominating the global market, multiple other options exist. One of the newest certification systems, certainly the most stringent, is the Living Building Challenge (LBC). Like LEED, LBC was launched by a chapter of the United States Green Building Council, the Cascadia Green Building Council. Since its inception in 2006 by the non-profit Living Future Institute, LBC has only awarded six buildings Full Certification. Over one hundred other design teams have registered projects with the Institute. Currently only buildings have been awarded certification, but development at all scales, including landscape, infrastructure, and neighborhoods are eligible. LBC claims to "[define] the most advanced measure of sustainability in the built environment possible today and [act] to diminish the gap between current limits and ideal solutions."[21]

Living Building Challenge relies on a rigorous rating system of seven "petals" that are comprised of twenty imperatives. The categories are pass or fail, and the lack of any petal denies a project Full Certification. The seven petals are site, water, energy, health, materials, equity, and beauty.[15] The twenty imperatives are all mandatory and each "focuses on a different sphere of influence." Based on the project typology, the option to scale jump is possible. Scale jumping is allowed when buildings wish to share green infrastructure. The three levels of certification under LBC are determined by the number and type of petals earned. Living Status, or Full Certification, is given to buildings that attain all of the imperatives assigned to its typology. The second certification level is Petal Certification. This option requires the satisfaction of three or more petals. At least one of the earned petals must be water, energy, or materials, and imperatives 01: Limits to Growth and 20: Inspiration and Education must be achieved. The third certification option is Net Zero Energy Building. It recognizes building typology projects that achieve the energy petal and a subset of imperatives from other categories.

The Living Building Challenge is unflinching in its goals and rating, and therefore is largely inflexible. LBC mandates that projects not use materials from the Red List, a strict guide listing hazardous materials. [See Appendix C] Additionally, as aforementioned, the only opportunity for

scale jumping occurs when multiple buildings or projects are seeking to operate in a manner where they share green infrastructure. Apart from this instance, there are no optional or regional credits as with LEED. LBC is also dissimilar from LEED and many other rating systems in that a 12 month post-occupancy period is required before evaluation. Projects must sustain their anticipated performance throughout the entire 12 months. Rating and post-occupancy evaluation are all executed by the Institute. [22]

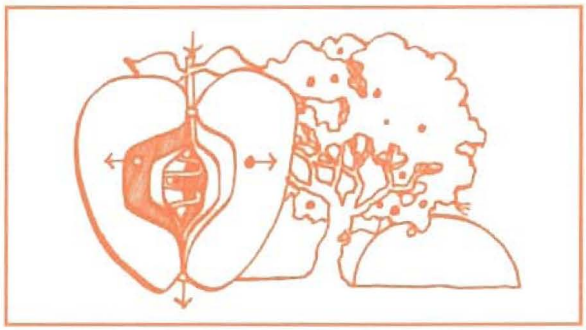

Image 10: Living Building Challenge Health petal

Living Building Challenge 2.1 is the most current standard for evaluation by the Institute. Projects that have already earned specific certification are not required to earn petals or imperatives retroactively; therefore, there are a few certified projects that were tested prior to the development of the equity petal for Living Building Challenge 2.0. Due to the gap period between the construction and evaluation of projects, team members must register projects in the design phase to ensure they are rated based on the proper version. This gap also accounts for the large number of projects that are listed as registered but have not met the time requirement for evaluation.[21]

The limited number of projects that have been registered and certified do not provide any clear financial implications regarding the LBC. Many of the fully certified projects were funded through donations from private entities. These projects went beyond the required elements and therefore inflated the total cost. Despite initial costs, meeting the water and energy petal imperatives lead to lower lifetime costs as they rely on alternative sources for normal building function. The limited scope of projects have not been analyzed as a whole by any outside bodies, therefore any financial information presented is strictly what has been released by the Living Future Institute.

With its popularity increasing in Europe and its established track record in the United States and Canada, the Living Building Challenge has produced and encouraged a growing number of buildings focused on sustainable design and green building. Its strict rating system is the most stringent of its kind, and the focus on public education differentiates it from many of the other rating systems currently on the market.[23] As LBC continues to gain popularity, new versions and standards will undoubtedly be released to maintain the high level of thinking and integrated design necessary to reach certification.

While programs such as Green Globes and the Living Building Challenge take on the rating of projects for specific design qualities, other big names are pushing the imperative of design for sustainability in their own way. Many groups and organizations exist that promote the education of green design and the movement to change the building sector, but none are as large or well-known as Architecture 2030. Architecture 2030 is an organization formed as a response to Edward Mazria's 2002 discussion on accelerated climate change. Officially starting in 2006, the initiative seeks to transform the built environment to help solve the impending climate and energy crisis. Giving the organization its name, the ultimate goal of Architecture 2030 is to finally reach a carbon neutral building sector by the year 2030.[24]

Architecture 2030's target is not achieved through a prescriptive methodology like a rating system. There is no point system, no award scale, and no certification for projects. Instead, the initiative outlines quantitative goals for the years leading to 2030. These goals are tied to levels of fossil fuel usage, greenhouse gas emission, and overall energy consumption of buildings. For example, in terms of fossil fuel usage, 2030 breaks down their targets accordingly: 70 percent reduction by 2015, 80 percent reduction by 2020, 90 percent reduction by 2025, and carbon neutral by 2030. The methods in which these standards are achieved are left open for individual designers and builders to formulate.[24]

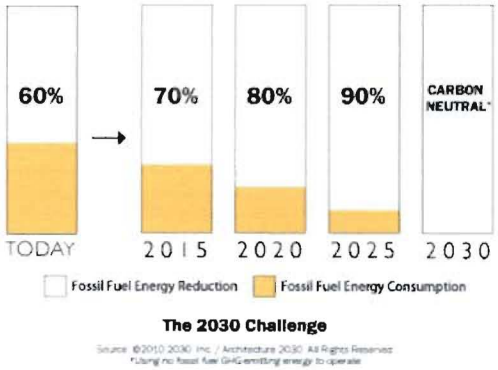

Image 12: Proposed energy consumption

The freedom that Architecture 2030 grants designers for reaching its goals has driven many projects built under the initiative to pair with a specific green rating system. Historically, LEED has been most popular of such systems.

Architecture 2030's relationship with the United States Green Building Council has made the LEED rating system neatly fall under the umbrella of the 2030 ideals. Although 2030 does not affiliate with any specific rating system, it does honor LEED ratings in their exemplary case studied projects. Architecture 2030 has also recently joined forces with a program known as the 2030 Palette. The 2030 Palette is an online forum that gives tips and tools for designers to use in implementing green design techniques. The 2030 Palette's aim is to help professionals in the building industry to design their projects to standards that coincide with the objectives of Architecture 2030.[24]

Architecture 2030's initiative has been widely accepted by both design and political realms. In 2006 the organization had its first major adoption by the American Institute of Architects. Later that same year, 2030 worked with the mayors of Chicago, Seattle, Miami, and Albuquerque to introduce Resolution #50- Adopting the 2030 Challenge for All Buildings to the U.S. Conference of Mayors. The resolution went on to pass unanimously. Other large and influential organizations have also since joined the 2030 initiative; names such as the United States Green Building Council, Royal Architectural Institute of Canada, Congress for the New Urbanism, and the Association of Collegiate Schools of Architecture, to name a few. Architecture 2030 has even gone on to shape energy and environmental acts passed through national levels of government in the United States.[24]

Architecture 2030 addresses all of the major issues within the building sector. Their goals for green buildings are mindful of both new construction, as well as the extensive retrofitting of existing structures. 2030 is also responsive to the shift in building materials and products that must occur. Similar to the timeline for buildings, the initiative outlines a reduction trend for the carbon footprint of products from present day to the year 2030.[24]

Whereas green rating systems remain voluntary and supplementary to the building process, Architecture 2030 is striving to become a mandated initiative. Their continued work to become adopted by both private and public sectors is to ensure dramatic changes are made to aid in the response to climate change and the fossil fuel energy crisis. Although much of the focus for 2030 has been in the United States thus far, the program is a global imperative. Architecture 2030's belief is that the building sector is both the central problem and solution to the climate and energy crisis.

Case Studies

Image 13: Suzlon One Earth exterior

Suzlon One Earth

Location: Hadapsar, Pune, India
Client: Suzlon Energy Limited
Architect: Synefra E&C, Ltd.
Year completed: 2010
Rating: LEED Platinum

In rapidly developing nations, such as India, green design is not always at the forefront of new growth. Suzlon Energy Limited, a top five producer of wind turbines globally, wanted to change this with their new headquarters. The project, which became known as Suzlon One Earth, was the company's attempt to build the most environmentally sustainable office building in all of India. Their plan was to break with the glass-box tradition of office parks happening in India and all over the globe without sacrificing any of their 816,000 square feet demand or amenities. Suzlon Energy Limited also wanted to create a project on par with budgets for similar projects but wanted to display the power of integrating green design choices. The result was a LEED Platinum rating for Building Design and Construction, a five star GRIHA rating (Green Rating for Integrated Habitat Assessment) [see Appdx. B], and a completely net-zero energy project.[25]

Synefra E&C ltd., the design firm leading the project, said in an interview with USGBC that choosing to begin their design project under the direction of LEED was a choice not based on a desire to get rated. Instead, the program

director from Synefra said, "Pursuing LEED certification made the design and construction process more structured and made results more tangible in terms of operational cost savings." LEED was the catalyst in structuring the design process and getting the team in the mindset for using green strategies, design decisions, technology, and material choice. In the same interview, a Synefra representative said that with such high goals for the project they felt it was necessary to use a green rating system that could get the clients, 6 design consultants, 18 technical consultants, 46 direct suppliers, and over 400 sub-agencies to start thinking harmoniously.[25]

This framework set forth for Suzlon One Earth manifested itself in a precedent of green design for not only India but the world. The project is set in an urban environment within Pune, but project leaders felt low-rise design was the greener alternative to another high-rise office building. Looking at energy processes, the project manages to produce 5 percent of its total energy needs on site through wind turbines (80 percent) and photovoltaic panels (20 percent). The remaining energy is generated entirely by wind turbines at a secondary location. Other passive design features were also implemented to aid in energy efficiency. Such considerations ranged from sunshading louvers, to cooling ventilation towers, and overall site placement of structures. Another benchmark was water management at Suzlon One Earth. 100 percent of the wastewater is recycled on site through an on-site sewage plant or by re-introducing it into sanitary flushing systems, air cooling systems, and landscaping gardens. In addition, 100 percent of rainwater on the site is harvested. Another area in which LEED promoted thought was material choice. 85 percent of materials used were from regional sources, while 10 percent were rapidly renewable sources. Also noteworthy was that nearly 85 percent of all construction waste was recycled, which earned LEED points.[26]

The choices made at Suzlon One Earth made for an extremely sustainable design in terms of energy efficiency, but the design team also sought to meet the LEED guidelines for people-centered design choices. Credits were earned through design choices like workstations that allowed for users to have views outdoors and fresh air access to occupied spaces. Suzlon One Earth took the foundation LEED put forth and went a step further. They implemented non-smoking regulations, adopted a strict zero waste policy on the campus, and integrated social spaces that support communication between workers.

Suzlon One Earth was a project that set out to break records and shatter pre-conceived ideas about architecture. The national and global award winning project earned its LEED Platinum certification many times over. The

design team chose to use LEED as a foundation to get the conversation of designing for sustainability started – they did not set out for a particular certification. Energy performance, material choices, and design decisions at Suzlon One Earth surpass standards set by LEED BD+C under its certification in the 2009 system and also meet the requirements for the soon-to-be-released LEED version 4. The design team's decision to use the rating system as an educational formwork and foundation rather than as a ceiling proved to be extremely integral in the success of the project and allowed Suzlon to benefit from a building that met their needs and desires.[25]

Image 14: Exterior of the Palazzo Hotel and Casino

The Palazzo

Location: Las Vegas, Nevada, United States
Client: Las Vegas Sands Corporation
Architect: HKS, Inc.
Year completed: 2007
Rating: LEED Silver

The Palazzo Hotel in Las Vegas, Nevada, came with controversy. The resort and casino built in 2007 under LEED BD+C achieved Silver certification for its green efforts. At the time of completion, the resort set a record as the largest LEED certified building in the world by being nearly four times larger than the previous record holder. The Palazzo also became one of the first pioneers in building and certifying under LEED standards in the Las Vegas Strip region. The project went on to be awarded "The Energy Innovator's Award" from the Nevada Department of Energy which is reserved for "businesses, individuals, and governmental agencies that have successfully developed or deployed energy-efficient and/or renewable energy technologies, services, or policies."[27]

Considering the location of the Palazzo in the Nevada desert, water management became a key factor in making the resort environmentally

responsible. Mainly through the implementation of highly efficient water fixtures in guest rooms and common service areas, the resort uses 37 percent less water than conventional buildings. Another feature aiding this water conservation is the use of artificial turf in planting areas versus traditional landscape species. Other energy reductions come from features such as solar energy sources for pool water heating, occupant sensors on air-conditioning units in guest rooms, and lighting occupancy sensors in service areas.[27]

The Palazzo was also conscientious of its footprint during construction. Managing a strict waste recycling program from time of demolition through completion helped to divert 70 percent of waste from entering landfills. The building's vast steel structural system was comprised of 95 percent recycled steel. Finally, the concrete used in the project also had an average of 2 percent recycled content.[27]

Such efforts made the Palazzo and its LEED Silver rating an innovator in the large resort class of development. However, some feel the resort still doesn't warrant a rating as a sustainable project. The controversy lies in the scale of the project and the points in which it earned its certification. An article from *USA Today* states that efforts by the Palazzo do cut energy consumption compared to a non-green resort of its size but questions whether its scale can ever be truly sustainable. For instance, the article points out that the energy to heat the pools comes in part from a renewable energy source. Even so, there are seven pools requiring heat, thus undermining the energy savings. Some also argued that a resort boasting seven decorative fountains, an indoor waterfall, guest rooms with three televisions, and other such luxuries undercut the concept of sustainability at its core. Such amenities have little effect with respect to the current LEED system, as points for the final rating can be earned from other categories. The article also mentioned that the Green Building Council even rescinded its strict no smoking policy in LEED buildings once pressured by the Las Vegas Gaming Industry. This was due to the popularity of smoking in casinos. This particular feature has since been re-evaluated and is set for change.[28]

Controversy aside, the Palazzo in Las Vegas did make efforts to design for sustainability not previously seen in the luxury hotel industry. The Palazzo's endeavors were experimental for its scale and do still hold it as an industry leader in hotels and resorts of its class. As said by Rick Fedrizzi, president, CEO and founding chair of the USGBC, "The Palazzo is to be commended for achieving LEED certification. This facility is one that both the community and its guests can be proud of."[27]

Image 15: One section of Armstrong Point business park

Armstrong Point

Location: Wigan, Greater Manchester, England, United Kingdom
Client: Armstrong Properties NW, Ltd.
Architect: Jennings Design Associates
Year completed: 2012
Rating: BREEAM Outstanding

Opened in late 2012, Armstrong Point is an industrial office park that was named one of the top fifteen *Best of BREEAM 2013*. The project is the first renewable energy business park in the United Kingdom, as well as its first zero-energy-cost business park. The project was largely funded by the Regional Development Fund with hopes of "[harnessing] one very important priority, carbon emissions, while tackling another by supporting local businesses."[29]

The project relied on several technologies to meet its goal for minimal energy consumption and maximum energy generation. In fact, almost £1 million of the £2.7 construction cost went to the integration of renewable energy sources and other green measures. The business park utilizes a wind turbine and 300 square meters of photovoltaic panels to generate 100 megawatts of electricity per year, with all surplus energy being sold back onto the grid. The combined systems are projected to save over 40 metric tons of carbon emissions annually.[30]

Several options for solar and water were chosen. The technologies included in the project are solar hot

water heating, rainwater harvesting, transpired solar collector heating, and transpired solar collector cooling.

The south-facing exterior walls are covered in a perforated profiled steel cladding skin that is separate from the inner, insulated wall. This system, aided by the air pocket between the two layers, will help increase the heat collected by up to 50 percent. A fan draws the collected heated air into the building, lowering the need for additional HVAC systems. It is projected to provide 65-70 percent of the annual heat load on the larger units and up to 80 percent on the smaller.

In addition to these harvesting options, multiple other systems were included to lower tenant costs and meet BREEAM imperatives. These technologies included automatic monitoring and targeting so tenants can view how much energy is being produced in comparison to how much is needed, installation of LED internal and external lighting, improved U-values for all materials on the exterior envelope, and numerous charging points for electric vehicles.[29]

For its inclusion of these measures, the business park earned an Energy Performance Certificate rating of A+ and is projected to save over 200 megawatts of energy annually (compared to other typical newly-built accommodations of a comparable size built after 2010) and over 450 megawatts of energy compared to buildings following the 1995 energy regulation standards. This amounts to tenants saving over £2 per square foot annually because they will incur no energy costs.

A BREEAM Outstanding rating was targeted from the onset, and was used as the basis for most of the material and orientation decisions. The decision to build with a low carbon footprint came from Armstrong's discussions with tenants who wanted energy price security. The final design will afford each of the tenants up to 4 kilowatts of renewable energy per square foot per year – more than any other business in the United Kingdom. It effectively offers tenants no heating or lighting bills.[30]

The nine-unit development scored an 87.6 percent rating on its BREEAM evaluation and developers "are confident that this will be the first of many similar projects like this across the UK as organizations increasingly put renewable energy and energy efficiency initiatives at the center of their business strategy." Lord Peter Smith, Leader of the Wigan Council, is quite optimistic about further development in the area, saying, "The history of Wigan is built on energy but we are moving into a different era with scarcer resources. We have aspirations for a low-carbon future and this development is an excellent part of that."[29]

Image 16: Main entrance to Medtronic World Headquarters

Medtronic World Headquarters

Location: Minneapolis, Minnesota
Client: Medtronic
Architect: HGA
Year completed: 2001
Rating: Three Globes Certified

"At Medtronic we recognize the critical interdependence between human health and the environment," said Doug Fullen, Medtronic's Corporate Senior EHS Director. "Our well-being ultimately depends on the health and resources of the planet. For this reason, we continually strive to reduce our environmental impact. Environmental stewardship is a key pillar of corporate citizenship and provides Medtronic with a competitive advantage by reducing costs and managing risks." It was these philosophies that lead the world's largest medical technologies company to build green for their 509,483 square foot new world headquarters.[31]

The new headquarters, located in Minneapolis, Minnesota, achieved a three Globes certification overall, with a score of 838.5 out of the possible 1000. As well, the project received the Green Globes Continual Improvement of Existing Buildings (CIEB) certification from the Green Building Initiative for its accomplishments in sustainable operations and maintenance. The choice to certify with Green Globes over LEED was considered by the design team and clients. Nate Pommier, Corporate EHS Engineer, said, "We

wanted to understand the pros and cons of Green Globes compared to LEED and decided to pilot our World Headquarters site through the Green Globes assessment process. Going through the Medtronic WHQ pilot project, we have found an approximate overlap of 85% with LEED criteria while achieving similar results in a less costly and onerous manner."[31]

Outstanding categories for the Medtronic project were in Resources and Environmental Management. Medtronic's daily operations embrace resource management through intensive recycling which helped them achieve their 110 percent score in the Resources category. The 100 percent score they received in their Environmental Management category was greatly influenced by their onsite irrigation practices, their recycling and food service work, and their implementation of a "Conserve Team" which oversees all environmental management practices on site. Other notable practices that helped Medtronic achieve their Three Globes certification were their critical overhaul of lighting and daylighting, their encouragement of alternative transportation through public transit availability and carpool organizations, and their active preventative/predictive HVAC system. With over 1200 daily employees and 60 hour work weeks, it was a goal from the beginning for Medtronic to cut energy consumption in an industry known for its high energy demands.[31]

To receive the full Four Globes certification using the Green Globes rating system, Medtronic would have needed an additional 3 percent increase in their overall score. Nonetheless, Medtronic created a Global Facilities Council to work on establishing sustainability guidelines and standards for the continued life cycle of their world headquarters building. Jim Driessen, Senior Engineering Director and the architect of the Council said, "We look at 'first cost' plus 'life-cycle cost' in design, materials, and systems. We may be willing to spend more upfront if there is a significant payback in reduced long-term costs. The most significant example may be energy reduction, but there can also be savings in preventive maintenance. Some materials have higher maintenance costs than others."[31]

Image 17: Packard Foundation Headquarters

Packard Foundation Headquarters

Location: Los Altos, California, United States
Client: David & Lucile Packard Foundation
Architect: EHDD
Year completed: 2012
Rating: Certified Net Zero Energy Building, LEED Platinum

The 50,000 square foot headquarters of the David and Lucile Packard Foundation earned its Net Zero Energy Building Certification in 2013 following the mandatory 12 month post-occupancy tests. The project met the Living Building Challenge petal guidelines for site, energy equity, and beauty. From the onset, the design team used the guidelines set forth by the Living Building Challenge as the basis for their design decisions and later had the building certified by LEED, as well, for which it earned a Platinum rating.[32]

The main focus for the foundation was on the energy imperative, thus a majority of the focus went to harvesting renewable energy and minimizing energy consumption. The orientation of the building did not allow for optimized solar collection, so a larger photovoltaic system was required. The foundation relied on energy modeling to predict their energy needs, then added an additional 20 percent factor for safety. 915 total panels were used to produce 305 megawatts per year. The panels were high-efficiency SunPower models, the most efficient on the market at the time, and harvest 318 watts per panel.[33]

Some of the other energy savings measures include energy monitoring,

daylighting, LED lighting, and a specialized HVAC system. The energy monitoring relies on electric panel boards from which data can be pulled and examined. There are nearly 15,000 monitoring and control panels that comprise the building automation system. Daylighting was important to the client and is fairly abundant in coastal California. The building is formed by two thin wings flanking a central court yard. The narrowness allows full daylight penetration and results in a 30 percent reduction in the amount of energy consumed by electrical lighting. The lighting that is present is monitored and can be raised and dimmed as deemed necessary.

The building is not heated at night, rather it is warmed to the target temperature three hours before the workday starts and then turns off and relies on heat gain from office equipment and the inhabitants themselves. In warm weather, the building relies on a compressor-free cooling tower to cool water at night before it is stored in two 25,000 gallon underground tanks. Throughout the workday the cool water is pumped into pipes that run through chilled beams and air handlers. The system was designed to avoid pipes at 90 degrees and rather relied on a 130 degree angle system, making the moving water more efficient and allowing for a 75 percent reduction in ductwork and pump energy. In the Los Altos climate, there are a plentiful number of days that allow the system to stay at rest as natural ventilation is used when the doors and windows are opened.

The Packard Foundation Headquarters met the requirements of the equity petal by not blocking access to nor diminishing the quality of fresh air, sunlight, and natural waterways to any occupant or adjacent developments. The courtyard was made large enough and the roof angled so that no shadows from one wing would be cast onto the adjacent wing, even during the winter solstice.[34]

The project architect and the heads of the Packard Foundation worked closely together on the beauty and spirit petals, as they were deemed the most "fun." The goal of the foundation was to show that a more sustainable life equates to a better life and wanted to use their headquarters to showcase this. The building was designed to fit within the Los Altos contextual style and conformed to the street grid in order to better fit the urban pattern, despite the solar loss from that orientation.

The design flows openly between the indoor and outdoor spaces and was made to capitalize on the California climate. The largest room in the facility is considered to be the outdoor courtyard, as it is fully habitable. The indoor-outdoor connection was also highlighted with the sunshading devices, which can be manually adjusted but

largely stay open, allowing clear views to the natural surroundings. Nature is even incorporated onto the building with an accessible green roof that can be seen from multiple points in the building.

Although the project did not meet the Living Building Challenge petal for materials, there was great consideration put into their material selection. All wood was salvaged or FSC certified. All stone in the headquarters is from Mount Moriah on the border of Utah and Nevada, less than 500 miles from the build site. Additionally, the copper on the exterior is 75 percent recycled and has a long life span and integral finish.[32]

The hope of the Packard Foundation was to create a pleasant and healthy working environment for their employees and to show that designing and living more sustainably makes for a happier life.

Image 18: Exterior of the Omega Center

Omega Center for Sustainable Living

Location: Rhinebeck, New York, United States
Client: Omega Institute for Holistic Studies
Architect: BNIM Architects
Year completed: 2009
Rating: Certified 'Living' Building

The Omega Center for Sustainable Living is a 6,246 square foot building that is one of six fully certified 'living' buildings in the world. It met all of the petal requirements and imperatives under Living Building Challenge version 1.3. The project houses a wastewater filtration facility that uses its systems as a teaching tool and basis for an educational program about sustainability. Skip Backus, CEO at Omega said, "Omega is thrilled to have crossed the finish line, and hopeful that projects like ours will mark a new era in sustainable design, one that reflects a truly integrated approach to creating built environments that are in harmony with the natural world."[35]

The project was constructed on a greyfield that had been used by the previous owner as a burial spot for solid debris. The material, dating back to the 1950s, was dug up and sold before the building construction began. Omega met the second imperative of the site petal by creating their Habitat Exchange project in the Hudson Valley area in eastern New York.[36]

Water harvesting and filtration were particularly important to the Omega Center. The potable water comes from private wells on the campus and are used in the bathroom lavatories, drinking fountains, janitorial sink, and

wash sinks. Rain water is collected from the roof and stored in an underground cistern, which has adequate reserve for 100 percent non-potable use for a calendar year. The water is pumped on-demand to the desired location. After water is used it is passed through the Eco Machine for treatment, which treats nearly 3 million gallons of water a year. All water is then returned to the ground via subsurface disposal.

The Eco Machine is at the heart of the water harvesting mission. It treats wastewater in seven steps: first the water moves through the solid settlement tanks, to the equalization tanks, it then passes through the anoxic tanks to the constructed wetlands. The fifth step in the process takes the water through the aerated lagoons and the recirculating sand filter. Finally, it is distributed in the dispersal fields. It processes up to 52,000 gallons of water a day when the Omega campus is open and 5,000 gallons per day in the off season.[35]

The energy from the building comes in part from the arrays of photovoltaic panels mounted on the roof. The multiple arrays generate nearly 39,000 kilowatt hours per year, exceeding the 37,000 kilowatt hours of energy actually used. The building performs well above the anticipated energy modeling, surpassing expectations by more than 10,000 kilowatt hours per year. Different solar panels were used for the different surfaces of the building and were designed to maximize solar gain potential.[35]

The Omega Center also met the criteria of the health and beauty petals. These imperatives were met through material selection and large, operable windows that provide ample daylighting and access to fresh air. Air quality was carefully considered for the building. Ducts were kept covered and protected during construction, and low toxin cleaners were used during and post-construction.

The materials also were carefully considered. The project architect and contractors carefully avoided materials on the Red List, including formaldehyde adhesive, arsenic, and VOCs.[See appendix C] There were a few hurdles in determining what materials were actually in given products and on several occasions the verified "green" materials were considerably more expensive than their typical counterparts.[36]

Under Living Building Challenge 1.3 there was no equity petal, and the Omega Center did not have to meet that requirement post facto.

The building was designed to meet USGBC's LEED Platinum standards and sought complete 'Living' Building certification, which it earned in mid-2010.

Analysis

Sustainability is a multi-faceted, complex concept, and there are countless definitions of what it entails. Our definition has three intertwined components that span the built environment, natural environment, and social scope.

Image 19: Balance of sustainable design

We believe sustainable designs are both carbon neutral and net-zero energy, and they decrease dependency on non-renewable resources. The natural environment is to be mended, protected, and respected. Thus, environmental and ecological implications are at the center of design decisions with regard to site, materials, and building systems. Sustainability promotes behaviors that create healthy living environments and social situations, as well as an overall balance across all three components. By considering all three, designing for sustainability ensures that our actions today do not impede the opportunities of future generations.

One of the most positive aspects of green rating systems that occurred across the board is promoting thinking about sustainability and pushing for a more holistic approach to building design. Since BREEAM's launch in the United Kingdom in 1990 and LEED's implementation in the United States in 1998, the idea of designing sustainably has grown significantly. Each of the systems has a different format and criteria but ultimately holds the same goal: to lower the environmental impact of the built environment and lessen human dependency on non-renewable resources. While the benchmarks may be different, all of the voluntary systems and initiatives examined rely on the clients and designers to think beyond traditional construction methods and expand their level of consideration to a global scale.

The holistic design process which considers all portions of the project to be interconnected is integral to the success of green rating systems. According to Robert Koester, AIA, LEED-AP; rating programs "[provoke] conversation. From day one the client, the contractor, the subcontractors, the consultants, the designers are all discussing these questions."[37] Although this practice is not particular to any rating system, it is a

common approach that is almost necessary to reach an end goal of certification.

While we think promoting green ideas and sustainability is a strength of building rating systems, one of our strongest criticisms is that this way of thinking is not intuitive industry-wide and that the tax incentives granted for using a green rating system are often one of the main reasons clients decide to build sustainably. This is more of an indictment of the trade as a whole, but it is a major flaw that needs to be addressed. It is evident to most that we, as a society, cannot continue on the trajectory we are currently following without expecting extreme repercussions. Green rating systems encourage improvement but should not be necessary for professionals, especially in the design field. Rather, designing for sustainability should be first instinct and not something that has to be added to a project or done for the sake of earning a plaque.

We have shifted roles in the design world. Today, more than ever, the current generation of architects, builders, and designers have been forced to reconsider some of their personal values and take responsibility for any and all decisions that may be detrimental to future generations. The fact that it has taken the industry, as a whole, such a long time to accept the notions of sustainable design is both puzzling and disconcerting.

One positive aspect of rating systems, such as BREEAM, LEED, and Green Globes, is their tangible benchmarks. By using third-party affiliates, there is a concrete way to measure the impact of a building on the environment and with those metrics better, constructions are further encouraged. The main advantage of having set numeric values in rating systems is that they provide a goal for the designers from the onset. With such goals in mind and the technology to be able to measure it, now more than ever before, the design team holds significantly more power than in the past and can quantify the performance of their architecture. Buildings that reach the proscribed benchmarks serve as both billboards for the clients who own them and the design team who had the design capabilities to meet the ever-increasing standards of a specific green rating system.

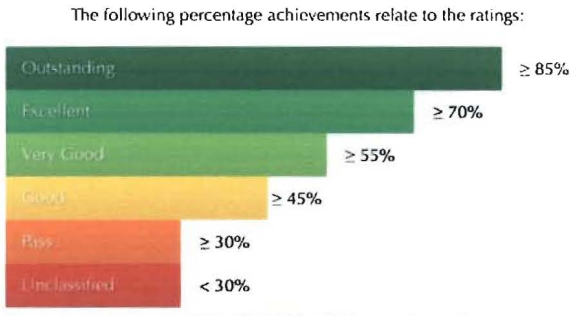

Image 20: BREEAM scoring tier

While having benchmarks is an admirable component of rating systems, we believe that for most programs they are far too low. The standards need to be raised across the board, especially in rating systems as expansive as

BREEAM and LEED. Earning a BREEAM Pass means only 30 percent of the potential points were earned. This is not enough of a change from traditional construction to warrant celebration or to be noted as an achievement. Although Jerry Yudelson points out in his book, *Green Building Through Integrated Design,* that one study found even basic certified LEED projects have 30 percent better energy and water usage than standard construction, we feel today's green construction should warrant higher levels.[38] The standards certainly should be achievable but not at the cost of truly designing greener buildings. While this may complicate the design process, we think that it also promotes innovation and creative thinking to meet the aforementioned benchmarks. As there are many different project types and countless influences in each design, the level of innovation should only keep increasing as green rating systems are used for setting a baseline number to achieve an even more expansive end goal.

In addition to the systems' standards being too low, we also believe the building codes are too low. While we do not propose mandating a green rating system through the building code, we do suggest using normative language that will increase the bottom-line standards for materials and recycling practices. For example, the current building code that has established minimums for values such as insulation should increase these requirements, even if only a little bit. By eliminating the market for lower grade products that require more maintenance and do not keep spaces as well maintained, the lifecycle of each project is extended, increasing the occupiable time for the building and decreasing the environmental effects, as well as operating costs.

Due to the fact that several of these programs are used multi-nationally and for several different building types, the flexibility of the point systems is to be commended. By expanding beyond new construction to rehabilitations and community-sized projects, the rating systems allow for versatility and encourage anyone with almost any type of project to build sustainably. The nearly unlimited number of options for buildings opens up possibilities for true innovation in multiple fields from materials to building form and allows for a larger discussion about social equities and the subjective goal of beauty. Flexibility encourages diversity, which is an impressive feat considering the once narrow scope of the rating systems that were scrutinized.

However, one of the most common and most pointed arguments against rating systems is that their flexibility allows for "point-swapping" or making design choices that do not make sense for a particular location or building type simply to earn a point with a particular system. A common example

of this is adding bike racks to buildings that do not have access to easy public access or public transit. Jonathan Spodek, AIA and Ball State Professor of Architecture, referred to such points as "green bling," or items for designers to simply tack on for points.[39] More attention should be spent on actually minimizing vehicular traffic or providing access to public transit than placing an arbitrary item on the exterior of the building that will never be used.

We are also leery of several project types that are either currently eligible for green ratings or once were. One of our case studies, the Palazzo in Las Vegas, is a prime example of a project where we questioned its magnitude, amenities, and existence. At some point, continually building monstrous towers in the middle of the desert and pumping water to them for human use and ornamentation takes its toll. On the other hand, as these types of buildings are still wildly popular, we commend the owners and designers of the luxury hotel for at least attempting to minimize their global impact. However, there were several projects that were discovered while researching that we were not only surprised had been green rated but were frustrated that such a rating was ever even considered, including several parking garages with LEED certification. While LEED no longer allows completely vehicular traffic-based buildings to earn credits, the fact remains that at one point is was deemed acceptable despite directly opposing some of the main points and goals of designing for a sustainable future.

Another questionable aspect of the flexibility is the lack of emphasis put on rehabilitation and reuse projects. It is easier to get higher ratings with new constructions, especially in terms of material selection. While using existing structures would more likely often be the sustainable option, new construction is clearly the most common and more preferred method based on the number of new square feet ready to be accredited by both LEED and BREEAM. It should be a simpler process to accredit a rehabilitated building than a new one because the process of using and improving an existing structure is a fundamental notion of sustainability while it simultaneously helps to prevent sprawl and urban abandonment. Associate Professor of Architecture at Ball State University, Olon Dotson shared his sentiments on the current rating systems and their response to existing structures or lack thereof, "I have a bias out of my concern for our institutional abandonment of our cities. I think that LEED ND is a start, but it's a long way from a solution."[40] Using what exists is going to be a major challenge for the upcoming generation of designers, but they should not have extra trepidation or avoid trying to green a building simply because of the difficulty to earn a high green rating.

Rating systems such as the Living Building Challenge appealed to us because of their rigidity. The Living Building Challenge essentially operates on a pass/fail system, and if any portion of the project fails to meet the established standard, it is not granted full certification. This rigidity means projects are held to a higher standard and ensures a more environmentally friendly design. The unwillingness to lower standards, despite the extremely limited number of projects, shows true commitment to lowering the ecological impact of the built environment. While this goal may seem unattainable for most projects and potentially deter clients from registering projects with LBC, the buildings that do meet the standards can reputably be called some of the greenest in the world. Beyond that, there are also certifications available for buildings that meet some or most of the imperatives set forth, and most of the projects that have earned a lower Living Building Challenge certification are in the upper echelon of the other green rating systems. For example, the Packard Foundation earned a LBC rating of Net-Zero, the least stringent LBC scheme. It also holds a LEED Platinum rating, the highest of the LEED standards. The disparities between the two are a clear indication that smaller pockets of the market are pushing the envelope. As the imperative to improve building standards spreads across the industry, hopefully more projects will be at a level that emulates that of the LBC.

Technology has undoubtedly changed the face of architecture and the entire design process. Computer-aided design has given the field opportunities that it simply did not have five, ten, or fifteen years ago. Naturally, this shift in production methods has had an effect in designing green architecture. We feel that technology has both promoted and harnessed the efforts of green design in architecture.

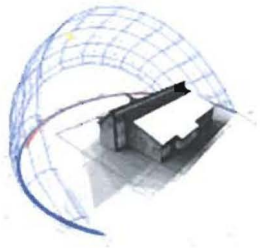

Image 21: Energy modeling from Ecotect

The largest way that technology has changed architectural design is through energy and performance testing. Plug-in programs for various design software now allow designers to test their buildings for everything from energy usage to sun and wind performance before ground has ever been broken. We see the encouragement of these forms of technology as a large positive in the field of green architecture. The incorporation of such techniques into the design process early can have a huge impact on a building's resulting performance and ecological footprint. Rating systems that promote such energy modeling are a great thing in our

opinion. When striving for a particular level of certification through a rating system, it is common to use this technology to see what level the building can reasonably achieve. Registered Architect, LEED-AP and Professor of Construction Management at Ball State University, Janet Fick stated how points and credits become very visible and tangible when one uses BIM (Building Information Modeling), energy modelers, and other technologies in their design process. She went on to say how such technologies can also encourage the early communication between various professionals working on a project, a very positive concept.[41] Energy modeling is just another tool architects and designers can now call upon to advance their green design whether it becomes rated or not.

Nonetheless, technology can be a double-edged sword of sorts. Its ability to continually advance materials, mechanical systems, and building systems, we see as a positive movement, but without careful consideration these systems can replace basic design principles. Technology has given us many systems that allow our buildings to be heated, cooled, and lit whenever and to whatever degree we wish. This can lead to massive energy loads when the system is trying to combat the natural elements outdoors. A view that Professor of Architecture at Ball State University, Rod Underwood, shared, "It's the old story of we can take a skyscraper, make it all in glass, and in winter we heat one side and cool the other. I mean, technology allows us to do this. If we looked at sustainable practices – ways of doing this without technology – with passive solar heating is one. Daylighting is one. Those don't require technology to make them work. They're just good, common sense solutions. So I don't think technology is what's going to necessarily solve our problem for us in terms of sustainable issues."[42] New mechanical systems allow such practices to occur despite the demand they place on energy requirements. A basic design principle is working with the natural and passive systems occurring onsite, which can greatly lessen such loads. Nearly all green ratings systems we have discussed promote this very idea. Points and awards are given in all the major rating systems for concepts like daylighting, passive ventilation, and renewable energy sources. Technology has allowed us to build whatever we can imagine, but it has also given us the capabilities to see our sites as more than simply a plot of land. We see it as very important that the rating systems promote not only using newer technology systems that are more energy efficient, but also that they encourage the integration of designing passively within one's specific climate and site. In his mind, James Kerestes, LEED-AP BD+C thinks that there is a major lack in connection between technology and green rating systems as they operate today. "Rating systems

could be a wall construction being a prefabricated assembly system that is adaptable based off the geographic location, so what kind of polymers, materials, and assembly methods can you use. Can we have houses that are basically like going into a supermarket and choosing components that can adapt and respond to a certain area? I think they could be closely tied and at the moment, they're not tied at all."[43] In our minds, technology should be a tool for designers to use, but not a source that can be relied on time and time again.

Many green rating systems promote other building patterns besides environmentally conscious design. LEED and the Living Building Challenge both have initiatives targeting the promotion of healthy cities and lifestyles. These programs incorporate site designs for buildings that include concepts like walkable communities, access to public transit, and encouragement of alternative forms of transportation. These ideas can have implications that both improve the environment, as well as improving the vitality of a city. It's a way for green rating systems to affect more than just a single building on a single site. We see the integration of concepts such as these as an important part of green rating systems. Although Jonathan Spodek did point out that the integration of such concepts into rating systems can be a challenge for different projects on different sites. He said, "For example, if I am building in a town without public transportation it will be very hard to get some of the LEED points versus building in a dense urban core."[39] Still, they are ideas that hold value for cities which need to not only manage the energy and climate change crises, but the threats of social and economic degradation; both issues underlining much of the 21st Century.

LEED takes on these ideas in very physical and tangible terms; items such as bike racks, reduced car parking, and sidewalks all earn points in the system. The LBC takes many of these ideas to an important next step in our opinion. We see LBC's efforts as expanding on what the term sustainability can mean in design. LBC devotes an entire petal to the term "Equity" which involves designing for appropriate human scale, social justice and rights, and the right to access nature. The integration of such ideas into a rating system begins to coerce designers to design with more than just the client in mind.

We believe this emphasis on regionalism in design and green architecture can have significant impacts on communities. Something we also applaud that has been notably integrated into the Living Building Challenge and LEED rating systems is the design of sustainable sites. Both rating systems work to protect natural habitats, encourage site redevelopment, and careful vegetation and water

management. The LBC goes as far as mandating habitat exchanges, which involves the equal allocation of land for nature off-site for what is used on-site. Just as we found great importance in the investment of time and effort for making the city healthy, we also see this effort to improve the natural habitat as key. In the search for sustainability, this idea of not only building green but offsetting the land consumption makes a huge difference.

The idea of aesthetics is perhaps the most observable of the elements that go into a design. Those with any level of education or familiarity with design have a sense for whether a project is visually striking or unpleasant to them. This is often times how much of our built environment is judged. What this notion of beauty in architecture has to do with green rating systems can be a bit uncertain. In our studies, the only green rating system that outright deals with the valuation of beauty since Wells is the Living Building Challenge.

One of the LBC's petals for full certification is the achievement of the Beauty+Spirit award. In the words of the LBC, "The intent of the Beauty Petal is to recognize the need for beauty as a precursor to caring enough to preserve, conserve and serve the greater good. As a society we are often surrounded by ugly and inhumane physical environments."[21]

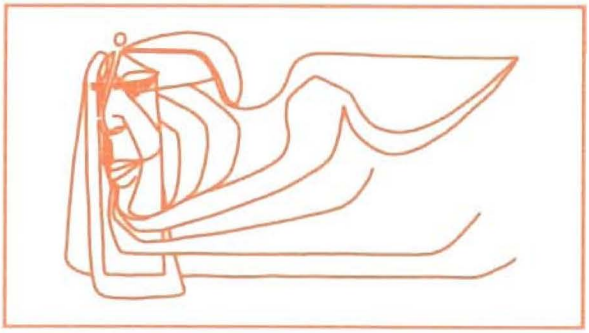

Image 22: LBC Beauty petal

Whether the design is striving for green status, may it be rated or not, we see importance on placing value in the visual aspects of a design. The aesthetics of a project is part of the field of architecture and should thus be included in green architecture as well. In the words of James Kerestes, "I think that's the greatest thing about what we do. [Architecture] really is a summation of the arts."[43] With systems like LBC, this artistic and creative license given to architects is appropriately being scrutinized.

Our main concern with the LBC petal focused on beauty is its level of subjectivity. When green designs are rated through any of the systems we have mentioned, nearly all of the metrics being judged are quantifiable. This makes receiving a particular certification level a completely objective process. The LBC beauty petal, however, lacks a sense of tangibility. It is unclear whose judgment or what concepts constitute a beautiful or spirited building.

Another credit lacking concreteness is the LEED Innovation in Design credit. This series of points is

reserved for projects going above and beyond the mandated standards set forth by LEED. Although much less subjective than the beauty petal in the LBC rating system, the actual quantification for achieving the Innovation in Design points is not explicitly listed under LEED's scoring information.

Despite the ambiguity surrounding the LEED Innovation in Design points, we still feel the encouragement for innovative design is a good notion to include in a rating system. Many efforts of the green design movement are pioneering endeavors already, so we feel awarding designers to push the envelope further is a positive exercise. Rating systems have placed themselves in a position where they challenge the status quo in the design field, so in our opinion they should continually push all levels of the design. Olon Dotson shared a similar thought in that green design is a new challenge and architects must be as innovative as possible to respond.[40]

When analyzing the processes of green rating systems, an important factor to examine is the scoring process. Each are scored on various point, check, and credential systems, but a common feature that LEED, Green Globes, the LBC, and BREEAM all share is their third-party validation. Each system uses a group of independent judges to assess a project's green efforts, an important practice in our opinion. As we see it, the validity of the system relies on this objective third-party verification. Daniel Overbey, Director of Sustainable Design Practices for Browning, Day, Mullins, Dierdorf Architects in Indianapolis, said, "Other parties are looking at your documentation to make sure that you're achieving all these things. It's what gives the entire system legitimacy. When the going gets tough, when the dollars get strained, when the time is short, it's very easy to cut corners, and there's no consequence for it if you don't have to certify the project."[44]

Although we see strength in the manner that these green ratings systems are operating, we do see a flaw in their lack of follow-up. Some, not all, systems require a post-occupancy assessment to determine if the building is operating at the efficiency levels that its design claimed it would. This period can range in span, but an average for most rating systems is around one year from completion. In our opinion, a truly sustainable building is designed to operate at a high-level of efficiency for many years. A favorably-rated design should thus require more post-occupancy testing than a one year, one time visit. Thinking about moving to a more sustainable built environment means looking at architecture with longer life cycles. This means designing buildings to last many years structurally while performing at optimal levels mechanically, and having a certain level of adaptability functionally.

As we see it, a specific certification from a rating system should only be valid for a specified period of time. As we continue to raise our standards for what green design is, buildings wishing to maintain the certification as a green project should be mandated to update their standards in accordance. Continued post-occupancy testing could reveal what adjustments in buildings can be made five and ten years down the line to help maintain an environmentally-responsive building. Achieving a certification from a green rating system is a positive step in the direction towards sustainability, but committing to the cause long-term is the next step in reaching that goal.

In conjunction with being validated by a third-party, some green rating systems also work with third-party organizations for the development of credentials. LEED has been noted for its involvement with the Architecture 2030 initiative in the development of some of their standards. While we find the collaboration between initiatives and rating systems to be an innovative way to push green ideas forward, other involvements can be less desirable. Material companies in particular have been known to support or contest the implementation of green rating systems based on whether or not the system benefits their product. A prime example of this is Green Globes and the fact that a fraction of their board is made up of material manufacturers and timber industry stakeholders. Not surprisingly, Green Globes barely questions materiality, let alone creating a proscribed list of materials, like the Red List of the Living Building Challenge. A critical look into materials should nonetheless be an important part of any rating system. As Robert Koester put it, "When you secure a rating you have to prove chain of custody of materials."[37]

Image 23: Red List logo

We see the involvement of companies and brands as a detriment in the shift towards sustainability. Green rating systems are not meant to placate the commercial market in our eyes, and should not be structured around their relationships to specific products.

Outlined and discussed in this paper thus far have been a few of the most popular green rating systems in the building sector today. LEED, the LBC, Green Globes, and BREEAM each offer slightly different ideas and methods for the implementation of green architecture. The popularity of particular rating system names and eventual branding of names has had a large effect on what it means to have a rated building. Robert Koester expressed his views that LEED has been and

continues to be the largest market driver.[37]

As Koester pointed out, as green rating systems continue to climb in popularity their influence on the market subsequently increases.[37] Having multiple rating systems available, in our opinion, creates a healthy sense of competition in the field. This does not allow one system to dictate what green architecture is or what standards qualify as being sustainable. Throughout our interview process of industry professionals we saw a consensus aligned with this same idea of healthy competition. Janet Fick, said that she feels the market needs multiple rating systems. She mentioned that having multiple systems allows professionals to choose a rating system that focuses on the concepts that their particular project needs.[41]

While the need for multiple rating systems was an opinion shared by us and the majority of interviewed professionals, it was not the only one. James Kerestes said that the field of architecture shouldn't need a rating system to begin with. Kerestes went on to express how architects are said to design for the health and safety of people, thus they should already be designing with these intents in mind.[43]

Unfortunately, designing sustainably is not yet a habit for most in the building industry. Until it intuitively occurs, we believe green rating systems are going to remain as a strong component of the green movement. We also see a need for them to remain a prescriptive process. Without green design being integrated into the design process for many established design professionals, a prescriptive process gives both new and existing designers a guidebook to green design. This is what gives value to point systems like LEED and online guides and resources that come with programs like Green Globes.

Also important to note for the future of green is design is the role of green initiatives. We see green initiatives such as Architecture 2030 as good precedents for the shift to sustainability in the built environment. They provide overarching goals for architecture and the building sector that can then be attained using green rating systems. Although we find such initiatives as strong drivers in the field, we see their lofty goals as unattainable in the proposed time frames. Initiatives such as Architecture 2030 are striving for levels of environmental protection that are simply not in compliance with the green standards being put forth by rating systems today.

A topic often emerging from the discussion on green rating systems is their relationship to mandated standards. We see the role of green rating systems as something that cannot be fully integrated as national or international standards. Their nature is structured so as to be chosen based on a singular project's needs, thus the

required use of a single system undermines the intent. We do see the possibility of a state level, or equivalent, government authority promoting the use of a green rating system or its comparable results; much in the same way that an initiative could be adopted for its goals. Both the United States Armed Forces and General Services Administration currently follow this model. This coincides with our view that rating systems should support regionalism in their goals.

Green rating systems have only been in existence for a few decades at best, we feel their intents are in the right place but should continue to evolve to become more stringent. The future of the built environment is increasingly becoming shaped by green rating systems, making the need for high standards imperative. A fear in the industry is that it is moving too quickly, past the comfort or abilities of the field today. Dan Overbey expanded, "There's this urgency that all these players in the green building rating systems have and then how fast can the market really pick it up." We feel, however, green rating systems are an effective catalyst for solving the climate and energy crises. Rating systems exhibiting strong standards should not be feared or discouraged by the industry, but should be embraced for their unwavering commitment to protecting the environment.

Appendix A

Interview Transcripts

Daniel Overbey
AIA, NCARB, LEED-AP BD+C
Interview conducted Monday, February 17, 2014 by Emily Newton and Jaben Temple

What is your history with green rating systems?
I'm most familiar with LEED by a long shot. I've been an accredited professional since August 2006. And I've been involved with the US Green Building Council also since 2006, the Nevada chapter. And since 2008 when I moved to here. So I've been intimately involved with USGBC in particular. In fact, I've been serving as a subject matter expert for the LEED version 4 deployment. So I was heading up the Indiana chapter task force for the LEED regionalization for version 4. They've got five different versions of LEED. And so there's the building design and construction, BD+C. I've been on the LEED AP development sort of committee. In fact, I'm going to DC next week to help with the exam and everything, GBCI. So I've been involved with USGBC and GBCI for a number of years.
BREEAM I'm much less familiar with – just what I hear from projects. I'm not very well familiarized with that at all. I understand their rubric for concerns with the built environment, and how they rate those, and how that incorporates into lifecycle assessment. And also I'm a little bit familiar with Green Globes, too. But again I've never walked a Green Globes project through, but as you guys know I'm pretty well-read on this topic, so I'm always kind of an information junkie with it. For instance, I know Jerry Yudelson just became the green building -- GBI, arm that creates Green Globes -- just became their new president, and he's actually a LEED fellow. You go Green Associate, LEED AP, and then you've got the Green Fellows. It's kind of like the FAIA on the USGBC side. So it's kind of weird that somebody's jumping ship and going to the big competitor there. I think he'll do good things for it. It's probably going to give Green Globes more legitimacy. I think that he's going to re-tool some things and make it more competitive in the market place. It's lost a lot of credibility because if you were to do some digging, Wade Outer with treehugger.com and some other sites, over the years, and building green also, with environmental building is they've all done some mining into their board of directors and found out basically it's the wood and chemical industry propping up this player in the green game. You know, Green Globes was basically because USGBC with their membership body voted to stick with FSC certified wood and not any of the competitors and to start to give you credit for phasing out PVC and stuff like that. Basically, the American Chemical Corporation and the SFI and all these guys came together and were like, we'll create our own competing rating systems. So that was always kind of shenanigans going on with those kind of politics. But I think Jerry Yudelson is going to give it more legitimacy in the next couple of years. And I think LEED needs some competition. They don't really have any competition right now, so I

think they need some competition to be better in the long run. That's a really long-winded answer.

How do you feel green rating systems have affected you as a designer?
It helped me survive the recession, I'll tell you that. You know, I moved back here in March of 2008 and that was when crap really hit the fan. All the firms in town were cutting people left and right, and they cut everybody who came in after me, and then they jumped over me and cut several people over me, so I was kind of spared execution. I think it's only because I basically have what people, to use the cliché, I have green job. So the expertise that I brought in that arena helped basically save my job at some point. And it's led to opportunities like this. I wouldn't be teaching if it weren't for having that information, that technical knowledge. So I think for me as a young professional, the green building expertise and LEED and energy modeling and all that sorts of stuff gave me, at least at that point in time, an advantage in the marketplace. I don't know if that would be that case no because it seems people are starting to become, overall, more savvy with that stuff. But back in 2006 and 2008 it was a differentiator for sure. It probably still is now, but not like it was back then. Back then if you got your LEED AP it was like a [big deal]. Now you're almost expected to have it if you're going for a job or something – to at least be a Green Associate.

How do you feel that green rating systems have affected the market?
It's definitely transforming the market. I think that there's no doubt about that at all. When I was working on my first LEED project back in 2006, I remember having to call Johnson Manville and CertainTeed and all these companies trying to find – Hardie, James Hardie with the Hardie Board, also – I was calling all of these guys trying to figure out where are your manufacturing facilities; is it within 500 miles of our site; what's the recycled content; what's the VOCs, calling Sherwin-Williams trying to get VOCS. They've got their MSDS sheets, but they didn't have their little cut sheet on emissions or solar reflectance index, stuff like TPO. You know you go with stuff like Firestone, you want to use a TPO membrane. Well, I don't have any information on what the solar reflectance value is. You've got to get ahold of their technical guys and got to go look at some of their testing and they send you these big old reports. And I'm going through trying to find stuff and highlighting it. Now, you got to the Johnson Manville website and it's got a little "here learn about our products and LEED." Click. And any one of their products, click, pdf, boom. Everything in one spot. You guys kind of have that stuff at your fingertips now, back in my day you really had to search for that. It was really hard. That cycle is happening again with LEED version 4. You know, I was talking to you guys about environmental product declarations and product category rules and health product declarations, all that sort of stuff. Now that's the new VOCs and recycled content metric. Now you're calling manufacturers and you're like, "Well,

we've got our cut sheet on all your LEED credits. It can get you up to ten LEED points" and it's got all the talking points and you've got your little sheet with everything, but that's not... no. I need to know, do you have an environmental product declaration. I need to know that. They have no idea what you're talking about, so it's just like it was about eight years ago in its own way. I'm sure in another eight years you'll be able to go to websites and boom, product transparency. You've got all of the information. You know, material health, toxicity, global warming potential, all that sort of stuff is going to be just right there readily available, and you guys will be really savvy at it. It'll be second hand, just like VOCs and recycled content is now. It's going to be something just really easy to access. So it is a driver. That trick in the whole thing is really that balance between the urgency to transform the market with some of these pending issues that we have right now, parts per million of carbon in the atmosphere and the acidity of the oceans and just poor environmental quality – all these sorts of things. So there's this urgency that all these players in the green building rating systems have and then how fast can the market really pick it up. So USGBC was a little heavy-handed with LEED version 4 back in 2012. They were trying to do just like ASHRAE and ICC, they were trying to do this three year development cycle. There's LEED 2009. Here's LEED 2012. Then LEED 2015. And we're just going to keep marching and by 2030, LEED version 10, to get certified it's going to be a net-zero energy building. That's the course they were on. They got push-back from all their stakeholders and said basically, "this is too much change too quickly. We can't handle it." So Rick Fedrizzi basically said, "Okay, we're going to kick the can down the road the entire year. We aren't going to release LEED 2012 until 2013. We're going to call it LEED version 4 instead, and we're going to leave LEED 2009 open until 2015. So right now, you can still sign up for the old 2009 if you want to. I can tell you on the practice side, most owners want to go with what they're familiar with. They don't care in this climate as much, like they do in some other markets, about environmental – how should I phrase this. They'd rather stick with what is a clearer path for them than get sucked into some system with all these unknown variables and an unknown path and an unknown magnitude of effort for what's ultimately going to just be another LEED plaque. Either way you're getting a LEED plaque. You know, around here if it's LEED silver, it's LEED silver. Does anyone talk about if it's a version 4? And even if they did, would that really mean anything to anybody? To you guys it would. To me it would. But to the general public, LEED silver is LEED silver. So why go through the strain of version 4 when you can get version 2009 and the broader market doesn't differentiate that? Now in California, if you go to San Francisco, it's a different story. But here that's kind of what the situation is.

How do you feel green rating systems have affected the building process?
It's prompted people to consider some of these issues a lot earlier in the design process. As much as people like to talk about point-chasing on LEED, you know you

just jump through these hoops to get a LEED point, it still has the effect, though, of making people talk about and consider these issues earlier on. If you want to talk about something like walkable streets and as a developer you're going to have your building and it's going to have walkable streets. Nobody really knows what that means all the time. That kind of idea can mean different things to different people. So by point-chasing, by saying it has to be a quarter mile to two different bus stops, or there have to be bike racks and you have to be within a certain proximity of changing facilities and a viable biking network, they draw the line in the sand for these credits. It makes people have specific prescriptive accomplishments they have to achieve and that demystifies some of these more NEBULOUS concepts like walkable streets. It's kind of a double-edged sword. People are complaining about point chasing, but the system works in the sense that it has a very clear, explicit, prescriptive sort of accomplishment you have to achieve. So you talk about those things way earlier on than you used to. If that makes sense.

Do you see a benefit in registering projects with a rating program?
For sure. I get this a lot with clients wanting to make it LEED ready, or LEED gold or LEED silver equivalent. And that's really a hollow promise because what the certification does, the reason why you have to pay money to get a plaque on your wall is because there's an entire team of third party, unbiased experts that are going to review your documentation and verify that you met what you set out to accomplish. If you just want to make it LEED gold certifiable with no check, that's like going through our class and me never giving you an exam. I assigned you readings, you told me you did the readings, you did the homework. You can copy off your partner, you know just circle all the answers and just turn it in. But if I don't grade anything and I don't review it or have the mechanisms in place to make sure you're doing it yourself, you'll still get through the class. But did you really accomplish anything? It's too easy to just say, well, that adhesive doesn't really meet but it's cheap and it works out well for this product and it's just a little bit. I mean 95 percent is good, so we're just going to go ahead and use it anyway. No, that's not what the credit says. Other parties are looking at your documentation to make sure that you're achieving all these things. It's what gives the entire system legitimacy. When the going gets tough, when the dollars get strained, when the time is short, it's very easy to cut corners, and there's no consequence for it if you don't have to certify the project.

Do you feel green rating systems for projects should be mandated by law or code? Why or why not?
I think this gets into a broader discussion like we had in 373 about what's a code versus a standard versus a rating system because these rating systems were designed to be voluntary. They were designed to push beyond what the market can readily achieve. So

it's a challenge. While some jurisdictions at various levels have adopted these certification systems and mandated them for their jurisdiction I think what I've seen is that it's not a good fit. As a professional you have to meet code. The building inspector's going to come in and know exactly what you have to meet code. You can control that within your scope of work. Going back to the third-party certification, the third party's going to review your building, review your documentation. You've got a lot of different contributors to it. If you as architects are responsible for getting a building to LEED certified and it's mandated, you don't have ultimately the control to make sure that that happens. It's out of your hands. So it really puts you at a major risk. And I think that that complication there and similar issues that stem from mandating something that's meant to be voluntary causes problems and probably doesn't give that sort of mandate the teeth it needs, the longevity that it needs. That void can be filled much more appropriately with standards with normative language that can be clear to design teams. So that instead of saying one way or another you have to save 15 percent, in the code it's like you need to make sure that your wall system has R-13 insulation plus 7.5 continuous. It's just really cut and dry. You can design that and if the building for some reason – there's any number of reasons why it might not perform like it needs to – you still know that you did everything that was within your control to make sure that it got there and nobody can blame you for it if it doesn't get there. Occupants could leave windows open, mechanical systems could malfunction, or whatever. At least you've done what you needed to do. It's a better deal for the designer.

What is your opinion on the criteria on which green ratings systems are based?
They've all got different development processes. Green Globes, for instance, allegedly adheres to their own ANSI standard for consensus-based development. USGBC does not do that. They're not ANSI compliant, but for version 4, for instance they did take into consideration 22,000 comments over the process of developing that rating system so I don't see how you get to call that not consensus-based. I know from experience all the different committees and the diversity of those committees and everybody involved there. Then BREEAM has its own system. Energy Star is very narrow in scope. It's just about energy. The Green Building Standard from National Association of Homebuilders, they're really tailored to residential. So I think they're all, in their own regards, they've got certain virtues and certain shortcomings. It's really kind of a mixed bag, and if you look at the market as a whole, it seems to me right now – February of 2014 – the market has responded most favorably to Energy Star and LEED. I think in a competitive marketplace the proof is in the pudding there, to use a cliché. I think what effect will Yudelson have with GBI? Will Green Globes gain more traction? I think competition like that in the market is good, but right now there's no one. It's not like the federal government's saying across the board every state you need to be using LEED. They recommend LEED for their own federal projects but they also give you options now.

They've said Green Globes can fill that void also and people are still tending to use LEED. So when given the choice, that's what the market is pointing to right now. That might not always be the case. There are other things, like Cradle to Cradle certified products, stuff like that and you don't know what the International Living Futures Institute, they have a net-zero certification system now, and Declare and Declare label, and what else. There's a social one now, too. What's it called? They have a social label about equity. Just. They've got Declare and Just. I think the market's going to eventually weed it out but right now there are a lot of people trying to vie for those spaces.

Please explain how you believe rating systems promote or restrain design innovation.

I think green building rating systems promote design innovation because you have these goals you need to accomplish, these performance goals, and again with the voluntary system you're not always so clear on what the path is. In fact, they leave capacity in the rating system for innovation. By allowing that capacities teams will strive to achieve those performance goals and strive to fill in those credits for innovation, and those seem to be incentive for people to do different things.

How do you think technology is influencing the field of sustainable design and rating systems?

Technology is making a huge impact. Just like our cars and our telephones and our computers are getting smarter, our buildings are getting smarter, too. Building management systems and different control systems, everything's starting to talk to each other now. At IBS week before last, I saw toilets that hooked up to a Wi-Fi connection. It was insane. Dishwashers, everything. Clothes washers will tell you when it's done and will sense how slow the clothes are. It's crazy what's going to happen. So the technology is going to lead to greater efficiencies and more innovation, for sure.

Where do you see the future of architecture with respect to green rating systems?

That's one of the big misconceptions in the market place. They look at things like ASHRAE standard or even ICC and their national green construction code and think it's going to make LEED obsolete. Well, go back. The acronym for LEED, they're going to continue to lead. As the codes start to bring up the minimum that you need to do, LEED and these other systems are going to keep ratcheting things up and I don't know where it will end. I don't know when you max out how far you can push the built environment, but for right now and the foreseeable future we're in this process of raising the floor on performance for the built environment. As the floor is raised the ceiling is going to keep getting raised. That's the same with standards, rating systems, all that. Every time ASHRAE comes up with a new version 90.1, they ratchet up stuff.

James F. Kerestes
RA, LEED-AP BD+C
Interview conducted Monday, February 17, 2014 by Emily Newton and Jaben Temple

What is your history with green rating systems?
I'm a LEED AP BD+C, specialty buildings and design construction. I've been a LEED AP for five, six years maybe. I worked on one LEED Silver project, but that was a five billion dollar, 100 million square foot project in Las Vegas. I've worked on a series of projects since then that had green implications, both domestic and abroad. One was in Tunisia that was going to be applying for either LEED or BREEAM, but they don't really have a rating system, which is part of the problem – that rating systems aren't really prevalent. So in terms of actually working on projects, the Vegas project was one in particular that was LEED Silver, and then I've worked on some where we applied the principles or were planning on doing it and then the projects just sink it and didn't get built.

How do you feel green rating systems have affected you as a designer?
In a professional context it really depends on two to three primary factors. One is the firm that you work in and their approach to those systems. Two is the client you're working with, and three would be the contractor that you're working with, as well. I say that because LEED likes to promote that fact that we try to educate as architects in the profession, educate clients and try to get them to do it. And most clients know what LEED is. Most of them have, I would say in my experience, an agenda or potential approach as to how they would use green or LEED or whatever it would be, and it always has some sort of financial implications. Anything that I've dealt with with LEED or green in any way in, I don't want to say professional, in an approved way, it always has some sort of financial connotation. When we were not going for LEED, especially in the last three years, we tried to introduce principles of green materials or practices as part of our design methodology, but to be honest most of that had more to do with selection of materials than it did with special reasoning and things like that, just based off the projects we were working on. But I've worked on projects abroad where we've also tried to do that, as well. In those conditions, one was in Libya and one was in Tunisia, those projects – oh, and another was in Uruguay – those projects don't fall under a specific rating system. So you're trying to basically do it yourself and put in what you think is appropriate. Everything will always go back and be beta tested or be pushed back in terms of cost, feasibility, availability and things like that. A lot of it has to do, too, with the approach that the client takes and what they see as their long-term or short-term investment in a certain property, what they see as a potential life span. In terms of an architect trying to educate a client on the cost benefits and the life-cycling of materials and why it's beneficial, if they're only going to own the building for five years,

it's harder to sell. So really, it's just not a clear cut answer, to be honest. It kind of is a moving target. Which is why I don't like LEED in general.

How do you feel that green rating systems have affected the market?
There are so many factors. In Philadelphia right now the largest skyscraper is the Comcast Tower, and the Comcast Tower has waterless urinals, but that means you don't need copper piping for the Philadelphia Plumber's Union to install. So they were sued. So there is unused copper tubing in the Comcast Tower to appease a constituent that is doing other things. I think it was something like they weren't going to work on the building or something. They put the inflatable rat outside of the project site and stuff like that. So the Comcast Tower might be able to pitch that it's LEED Platinum or Gold or whatever, but I mean as a system and as a service it doesn't go far enough. Just checking off a list is really not pushing what the original spirit and intent of green and LEED is trying to do as a system. There's tons of examples of ways that people are trying to undermine it. Politically, socially, economically.

What was the question again? In general as a market, it has primarily been done on two things. One is that you try to pitch it to a client or a client tries to use it as, a lot of projects I've worked on have been residential, so they try to use it as a way of selling it to tenants. You know, it's LEED Silver, LEED Platinum, or whatever. Carl Dranoff is a great example of that in Philadelphia. He's one of the biggest developers. We would try to pitch green technologies to him. He thought it was a waste of time, and his last three projects have been green projects. So I think it depends on your clientele and if they see a growing market for it, which I think there is, then they actually are trying to exploit it for more financial gains, not just the tax credits that they get from the building. So I think the market's there but the problem is that it's not there for the right reasons I think. Again, working on the five billion dollar casino project that was LEED Silver, one hundred million square feet. Really? It's asinine to me and kind of goes back to the point. It was on the site of the old Stardust. So they knocked the Stardust down first thing, then you're going to put a hundred million square feet of building on it. And the fact that something like that can even have a LEED rating is just crazy. It's a hundred million square feet of new construction after you imploded the Stardust. And you're supposed to feel good that you... I mean, please. That's why it drives me crazy. All this green, sustainable. It's all nonsense. Because not that it should be here. It's just nonsense to how it's presented and how little it does. People think that they do a Solar Decathlon house and they cheer for it. It's like, that's awesome if there were a million of them but my problem is that it's always a drop in the bucket and the bucket is so big and so daunting. That's why I really don't like the term sustainable. It's a horrible term, because if we sustain the way we live now, I mean, my God. I've told you guys this before, if you siphoned off all the CO_2 emissions right now, it still takes two decades for the earth to catch up to what we've done to it. We consume 50 percent more than what

the earth can even produce. The United States has 4 percent of its original forests still available. The United States consumes 30 percent of the world's resources, and we produce 30 percent of the world's waste. Holy crap. I mean, it's unbelievable. I think 30 percent of our fresh water ways are still drinkable. 30 percent out of the entire United States. That's why I have such a hard time. With the LEED rating systems it's not a benchmark of what we should be. It's just scratches the surface of really being more aggressive. LEED Platinum should be like LEED Silver. I think that's kind of the point that I try to push. My biggest gripe is that we're not leading the discussions and are capable of doing so. Even when I see the ways we discuss it in schools or professionally we're just chewing down the same LEED bull sh-t.

Academia is a way of pushing the discipline, with the discipline being the professional field, and that we can saturate the market with young talent, young people who are technically competent in more contemporary and progressive ways of thinking. The reason I think that's really advantageous right now is because of what the economy has done to the size of the professional market place in terms of bodies. Basically your corporate structure is a pyramid, and as they start doing layoffs they take a big cut out of the bottom because that's your lower level pay. But at some point your higher level associates: partners, principals, CMs and PMs, sooner or later you've got to take a chunk out of the top because the way you set up your contract you can't be paying a project architect. You can't have a team of like three PAs and one intern. You can't sell it that way. It's not a solvent corporate strategy. Eventually you have to start cutting out from somewhere in the middle and the top, and one of the barometers that they use is technical competence. If you don't know how to use AutoCAD, let alone Revit or Rhino or whatever else, you have an issue. Basically what's happened in firms is those two areas have been kind of wiped out. So there's an opportunity to really redefine the paradigm of what we do, which can be with more progressive ways of thinking about the environment and green strategies and things like that. With that said, in the school we should be pushing a progressive and really an aggressive way of thinking about environment, material research, documentation, fabrication, installation, robotics. There's a real opportunity to really push and catch up to the technology we have because we're behind everyone else. People like to get excited about Revit. Contractors have been using Revit ten years past we were, and they were killing us on their overhead because they were checking for conflicts even before us. They were using Revit basically as a way of conflict-checking and checking the architect and then of course when they find out all of these mistakes shoot out the RFI and get a little bit of money because they already know what's going on. So part of it has to do with technical competence. If we're just going to keep showing outdated Ecotect or the sun-shading studies in Sketch-Up or the Department of Energy plug-in for Revit and stuff like that, we can be going so much further. How do we look at advanced polymers as smart materials? How do we think about recycled material and what that is? Form, spaces,

prefabrication, assembly, pneumatics, all these things. It's a hot subject for me just because I come in from a professional setting, then in an academic setting we're at a very important part of where the profession is, and there's a really great opportunity for the academia to start changing the discussion. What's happening right now is a great example, too. Architecture, as a profession, has become more of a service industry. We service what developers want. They're driving the discussion even if we're going to introduce LEED ratings because to have a LEED rating you have to have certain people hired onto the office. Do you have a commissioning agent? Do you have an engineer that has got a LEED rating as well? Does the contractor? Are you limiting the scope of who you bid out in terms of a contractor who can do that? Are you going to get the bid that you want? It always comes back to a financial question. So part of it also comes down to the social portion. No one cares. That's the impression that I've gotten. There's people on this faculty that tout green stuff and they drive a f-cking Porsche. How do you take that stuff seriously? I mean, look at the building you're in. Those windows are supposed to open up so you get cross ventilation. They probably haven't worked in thirty-something years, but you're supposed to be really excited by the fact that you have a geothermal pump and a couple of bioswales every once in a while. But not all the parking lots are porous concrete or there're two charging stations on the whole campus. I don't know if you knew that. Just two. Two. No sidewalks. You can't walk anywhere. You're funny. I know why you asked me about this. I obviously have my opinions because I care. It's not that I don't care. It's not that I think it's all nonsense. It drives me crazy when I sit and watch how people talk about it like they don't give a sh-t. We really are in crisis. I think you need some galvanizing, pseudo 9/11-esque, something big has to happen before people actually care because I don't think most people care as much if it's not within their property line. Most people think that to be green you have to sacrifice or compromise your way of living.

Do you see a benefit in registering projects with a rating program?
No. I think projects are working toward a check list and not toward what the core values of what green living would be. It's kind of like, well, if I'm just good enough, like "C"s get degrees. That kind of it's just good enough. We shouldn't need a rating system to do it in the first place maybe is even the better response.

Do you feel green rating systems for projects should be mandated by law or code? Why or why not?
Yeah. It's already like that in Austria, Germany, there's a lot of places that are like that. It's difficult because of course it gets into political situations. My personal opinion is that it kind of goes back to I like someone making sure that the stoplight's working. The stoplight's there so that some yahoo doesn't kill me. It kind of goes the same way. If my neighbor's burning trash it's my air, too. It's just this notion of communal and social

responsibilities. I mean, we're all parts of the whole, so if companies won't regulate themselves just out of good conscience, then maybe someone has to do it. The overall effect is more detrimental than not. We're all sharing things. It's a gray area. I realize that. But my personal opinion would be that I would be for it, yeah. But hoping it would go to a further level. There are a lot of examples now where there's a lot of debate to the intrusion of government for forcing government buildings to be built a certain way. Which could be where is the money coming from or some constituents don't believe in it. Obviously that's why it's a very hotly debated topic. But if we do that maybe we're socialists.

What is your opinion on the criteria on which green ratings systems are based?
I don't know what the criteria would really be, to be honest. When I first got involved with LEED it almost seemed like they were just trying to nudge in and say we'll give you a rating and give you a tax credit, just do a few of these things. It showed that there was a trepidation and almost an intimidation based off of, well if we make it too aggressive no one will do it anyway. So basically now, I almost feel like it's kind of the same way. I feel like people have adopted this, and yeah they keep changing the thing all the time. Yeah, it's LEED, it's LEED AP, it's LEED AP and then a specialty, and it's this and that, it's interiors, it's existing buildings, it's new construction, it's ugh. The criteria to me just seems a mess and jumbled. Like I said, the criteria is based more off of what they think they may be able to get done rather than what they should be getting done. Again, I think the reason that they fight that is because they don't have a lobbyist on their side or they don't have a voice that's clearly illustrating what their platform is, but there's a clear discussion on the other side. So when I'm driving from Philadelphia to here and I see all the signs about coal and one sign for wind, it's like oh, okay. Frank Gehry hates LEED, too. He's another interesting person. I don't like Frank Gehry. I mean look how he builds, of course he doesn't care about LEED. I would look him up to see his approach to it and even another side of the coin.

Please explain how you believe rating systems promote or restrain design innovation.
I think they totally can be combined. Rating systems could be a wall construction being a prefabricated assembly system that is adaptable based off the geographic location, so what kind of polymers, materials, and assembly methods can you use. Can we have houses that are basically like going into a supermarket and choosing components that can adapt and respond to a certain area? I think they could be closely tied and at the moment, they're not tied at all. Solar panels are a good example of that. Solar panels are nothing more than add-on decoration. Instead of being integrated into the way we think about design, every time I see a solar panel it makes me cringe just because you can tell it's an afterthought. That's a technology in and of itself. There are already wraps

you can put on corrugated metal roofing systems that actually move and are integrated with that system. So all someone has to do is develop a system that has PVC paint or breathable polymer membranes or smart metals that somehow might be able to work with conducting heat and off-gassing. So, like, what would be a contemporary tromb wall or something? So there's definitely a lot of opportunities there.

How do you think technology is influencing the field of sustainable design and rating systems?

The technology is there. Whether it's actually being implemented or not is another story. Like I said, all you have to do is look at other fields and other disciplines where they've surpassed and they're always moving ahead. A good comparison would be to look at a car. When they design a car, they design it in a way in which it still formally looks like a car, four wheels and two doors, four doors, but there's a performance level. Now look at a house. Buckminster Fuller in like the 60s talked about Dymaxion Homes. The reason homes are square and ugly and boxy-like is because we didn't have the tools, the technologies, and the materials to move forward. Look at houses today. So obviously the technology has been there since the 60s, since Buckminster Fuller. All of those homes were completely self-sufficient. Even the space shuttle, for crying out loud, is a self-sufficient home, and it has worse exterior environmental conditions than we do. So for sure it's something that is present, but I don't think it's being integrated, not just in green technology but in architecture. Revit is not really. The pros of Revit is that you can significantly cut down your overhead costs and your billable hours for CDs because you can produce representations of drawings in probably a third of the time. But in terms of a form finding device or an integrated development of systems, it's COMchecks more than integrating systems with each other. So, I think they're disjointed at the moment. And I think it's another example of how the profession is so far behind the technology and a lot of the students are. When you graduate from school, it'd be interesting to see how many of you still use Rhino. The tool kit you're going to use is Revit and CAD. Part of that is also Autodesk's fault. I mean they bought Ecotect and packaged it and got rid of it and embedded it somehow into Revit, and there are other softwares but they're on the engineering side more than the architecture side. Which raises the question of why that is.

Do you see value in multiple rating systems or should there be an industry standard?

We should just build better houses. We shouldn't need a rating system. We should just build better because it's the right thing to do morally, socially. As architects, we are supposed to design for the health and safety of the public. Health and safety and welfare, right? We should just be doing it anyway. That's why it's funny to me that you're going to get a point if the contractor puts a wrap over the soil that you dig so that it

doesn't blow all over the place. Really? You need to have a point for someone to tell you to do that? You have to manage the storm water and things on site, really? That's why it's a joke. I mean these are all best practices. These are things that we should be doing anyway, because doesn't it just make sense that if you have a big pile of dirt that you don't want people breathing that in. But that's the point. That's the thing.

Where do you see the future of architecture with respect to green rating systems? It's up in the air. I take the pessimistic view that we're going to lead from behind. Unless there is some sort of galvanizing initiative or catastrophe and as long as there is a large contingency of people who lead the discussions who deny the conditions at hand – whether you believe global warming and all that stuff is manmade, it doesn't matter. The earth is changing. But even if it didn't exist, shouldn't we be doing these things anyway? The point is that it does exist. The point is that we are doing things to the planet that are harmful, and as architects and designers and builders, we are playing a role in that. So it's more of a moral and ethical question. It's a social responsibility. I left the professional environment for that. That's it. I was done. I would rather have the conversations in an academic setting and tell students where I've come from as a licensed architect and LEED rated and say, okay this has been my experience. I'm not the standard by any means, but when you leave you have a choice. You have a choice of what you do. You have a choice of where you work and the projects you work on. I have friends who work in construction management. I have friends who are watchmakers. I have friends who work in policy. I think that's the greatest thing about what we do. It really is a summation of the arts. As an architect or someone with an architectural education, you really can branch out. I think a big part of it is the discussion on policy. Mitchell Joachim with Terreform ONE is someone who I guess has had some discussions with Obama, who is certainly someone I look up to. He's a MIT PhD. guy. He talks about growing houses, grafting houses, thinking about redesigning the car, all sorts of stuff. But I think it takes bigger ideas and pushing things to kind of get the conversation going. And if someone disagrees with it, I think just the fact you had the conversation is healthy, instead of it just being right or wrong. So I think you've got it. I think you know where I come from.

Olon F. Dotson
Interview conducted Tuesday, February 18, 2014 by Emily Newton and Jaben Temple

What is your history with green rating systems?
I first heard, long before LEED started I had a friend named Anthony Floyd out in Phoenix, Arizona who was leading, of all places, the green movement out there. He just became a fellow of the American Institute of Architects last week. Pretty amazing guy. And he's the first person who started introducing me to the whole notion of green from a perspective of the global imperative. So my interest in green and my exposure centered more around the global imperative than it was LEED. When LEED first started becoming talked about and even when it was introduced I was not optimistic about it. I thought that they were going to commodify sustainability and that we were turning systems and rating systems into a bureaucracy, but LEED has done nothing but grow ever since. I also thought that working in inner cities should be taken into consideration because of our institutional abandonment of our inner cities and sprawl that we're contributing to takes away from any really legitimate discourse about green in the first place. Only recently has the movement started, like for example LEED ND, working for organizations like the Congress of the New Urbanism and others.

How do you feel green rating systems have affected you as a designer?
I did work on a couple of projects where we were trying to achieve a rating, like the Indianapolis Airport. And unfortunately I found it to be horse-trading, at least at an administrative level when it started coming down to points. I wrote the specifications for most of the airport, and I was specifying materials. I can give you an example of those specs where I was trying to specify products that would minimize the impact on the environment. LEED forced us to do that, and we had to do that in order to get points. But at a conceptual level, here we are designing a new airport in a greenfield and spending 1.2 billion dollars when we have an existing airport sitting there, and we're not committing ourselves to mass transportation to get people to and from the airport but instead building a 7200 car parking garage for gas-guzzling internal combustion engines. Any time we come up with a system to quantify sustainability then horse-trading is inevitable. You know when we're looking at points. You say, well I'm going to do a big box Walmart and I'm going to destroy the entire retail community of that city and we're going to end up with empty medium box stores all over the place, but I'm going to put in some skylights and some bicycle racks and get some points. I have some pretty serious issues with the whole thing. Especially when we start thinking about some of the societal struggles. This teaching and Fourth World Theory is basically a reaction to the quantification of sustainability. My whole social justice directive that I've put on this department and this college is a result of what I would call an abuse of the term. I think we're abusing it as professors and producing a bunch of students who are

abusing the word and spreading the term like the gospel. That's the way I am today. Tomorrow I might feel better about it, but I doubt it.

How do you feel that green rating systems have affected the market?
I do think that one of the arguments on the plus side, after all the negative stuff I just said, on the plus side it is creating normalcy. It's bringing normalcy to the design profession and the construction profession and owners. They're not as scared of green as they were fifteen or twenty years ago where it seemed that the use of green systems was really not affordable. I think that one part of horse-trading is contributing to the affordability. Sometime I may not be able to use this material because it's a little more expensive, but I can offset it with another product in another aspect of the building as a means to achieve green and keep the project in budget or achieve a green rating. That's probably the only upside of it. You know, we've talked about Coca-Cola and Pepsi or whoever and it is kind of desirable to suggest that you're responsible. You don't want to put out an ad that says, hey, we're going to pollute the skies because we're providing jobs. Back in the 1800s and early 1900s we used to do renderings of factories with multiple smokestacks with black smoke coming out of them because that was really a sign of progress. People were proud to say that the town of Elwood has a factory, too. You know, that's unthinkable today. I think about the cartoon Paul Bunyan. We saw John Henry. On the B-side of that is Paul Bunyan cutting all the trees down. We romanticize him. Now we go around the world trying to police deforestation in Brazil and East Africa and all over.

How do you feel green rating systems have affected the building process?
I don't really think that I have anything to add. I think that it's certainly impacted the Construction Specifications Institute and what we specify not only in terms of the use of materials or the raw components that go into materials but also the localness of them. There's a documentary that we have in our library that I used to use for pro-practice that got a little debated called *Skyscraper*. As a matter of fact the director of *Skyscraper* just died three days ago. His name was William Zeckendorf and Zeckendorf developed Worldwide Plaza in New York City, which was a high rise built on the west side in what used to be called Hell's Kitchen. It was designed by David Childs of S.O.M. the same designer who is vilified in a documentary about the World Trade Center. There were a couple of scenes in there. One, they were talking about the granite façade for the building, and the architects got all these samples of granite from all over the world. And they liked this one. It was kind of a rich red and it went well with what they were trying to do, and they weren't concerned about where it came from. That granite came from Brazil, and it was quarried in Brazil and then it was sent to Italy. They cut it in Italy. Then they sent it to the United States and didn't think anything about it. You know, it's just what we do. They all got in a plane and flew over to Italy to look at it and said we need

to improve on this or that, I really like this veining. Can you guys quarry a little more of that? We'll just discard this other stuff. There was another scene in there – this is in New York – the steel came from Japan and was sent to Luxembourg. Then it was sent from Luxembourg to Houston, and it was fabricated in Houston and put on a barge and went on the Gulf of Mexico up the Mississippi River to Cairo, Illinois and then up the Ohio River to Pittsburg, which is a steel capitol. They put it on a truck in Pittsburg and sent it to New York, and it was cheaper than just buying the steel in Pittsburg. So when we start talking about local, what does that mean? I mean, when we sit and eat an apple, or I might go get a banana today, was that banana grown in Muncie or in Indiana or in the Midwest or in the United States even? But I like bananas.

Do you see a benefit in registering projects with a rating program?
That's a tough one. I do see a benefit, but I just have questions about the methodology, questions about the commodification of sustainability. I do think LEED is improving and that's why it has all of these different classifications. I think those classifications are kind of responses to the type of criticisms that I voice and many others.

Do you feel green rating systems for projects should be mandated by law or code? Why or why not?
I think that they should be incorporated into code. Which, in turn, is law. I think there's a fine line between incorporation and a mandate. Some people are just not in a position to follow all of the policies and procedures that LEED has developed. Particularly people of lesser means. I think it's going to make life very difficult for them. And that kind of counters my thought earlier that the increasing popularity of the green movement diminishes the fear, but that's not across the board. You know, if I'm just trying to survive in the city.

What is your opinion on the criteria on which green ratings systems are based?
I don't think they're adequate. Part of that is personal. I have a bias. I have a bias out of my concern for our institutional abandonment of our cities. I think that LEED ND is a start, but it's a long way from a solution.

Please explain how you believe rating systems promote or restrain design innovation.
I don't think they really restrain design innovation. I think it promotes it because any time you're faced with a challenge then we are engaged as designers to be innovative in our response to it, regardless of what the obstacle is, if you want to consider green being an obstacle, which I wouldn't. I see it as being a challenge.

How do you think technology is influencing the field of sustainable design and rating systems?
Tough question. I think technology is a double-edged sword. We've kind of talked about that in class. I think technology can undermine the notion of local. On the flipside I think that it can enhance the normalization of local. An example would be the Plant in Chicago or Growing Power in Milwaukee. These organizations should be LEED certified just by their mere existence in an abandoned warehouse on the south side of Chicago with anaerobic digesters that are taking waste that would otherwise be sent to a landfill and digesting it. Basically it's a stomach sitting in the back of their property to help warm their building where they're growing tilapia and are engaged in hydroponics, growing kale and barley and other products. It's really wonderful. They couldn't do it to the extent that they're doing it in a closed environment in the city without technology –what Will Allen is doing with multiple species of fish from salmon to lake perch to tilapia to catfish and each of them having a specific environment with respect to water temperature. The technology at their facilities is just phenomenal. I see some good examples.

Do you see value in multiple rating systems or should there be an industry standard?
I see value in multiple rating systems because of multiple circumstances. I don't think that what's good for central Indiana is good for Scottsdale, Arizona is good for Miami, Florida. I think that the conceptual basis for these standards should be uniform. In other words, we're doing it for this reason. We're doing it because of the global imperative. Or we're doing it because we're destroying our environment at a rapid pace.

Where do you see the future of architecture with respect to green rating systems?
Unfortunately I think the bureaucracy is going to continue to expand. Architects who have a tendency not to be activists are going to comply. They're going to mandate accreditation within firms and they're going to continue to participate in the commodification of sustainability.

Janet Fick
RA, LEED-AP
Interview conducted Wednesday, February 19, 2014 by Emily Newton and Jaben Temple

What is your history with green rating systems?
Being here at Ball State, they made a commitment to the LEED rating system and I had an interest in sustainability before that. I used to work out at facilities and was an architectural designer out there and supervisor of planning for fourteen years. We were interested in sustainability because we didn't have any money. When you remodel a place it is cheaper to not move that wall over a little bit, or not relocate that door, or reuse that door somewhere else. So we looked at it from that side. Turns out that is a very sustainable way of building; trying to keep as much as you can. For the materials, we came into it for the indoor environmental qualities aspect of it. People get sick in buildings. So we were trying to find materials, paints, wall coverings, carpets, that didn't off gas the VOCs and didn't make people sick. We, my generation you could say, came into it from that side. Slowly but surely it became evident there were many other reasons to be doing it.
I worked on a building on campus from 1999 to 2001that was before Ball State made their commitment to LEED buildings, but I don't think LEED really existed in the scale that it is now, then. Ball State required that we did a lot of sustainable practices in it. It was the first building here that took sustainable practices and put them into action. We recycled all of the materials, the materials specified by the architect (Ratio) were all sustainable, and after that was when they made their commitment that all major renovations and new construction on campus are built to LEED Silver. They've completed that, and its ongoing, all of the buildings are silver but the geothermal building north of campus is gold.
I started a class in it when I was teaching over in interior design about the field of sustainability. As kids got interested in it, I was no longer having to convince your generation why they needed to be doing this. It kind of evolved into a LEED prep class. When I moved over to construction management, the class came with me. It's been expanded to both semesters. There has been enough need and interest that I've been able to fill two sections. I also have an online class where we look at some of the other rating systems. I don't really know much more than that. What I hear from friends in the industry is that Green Globes is becoming bigger because it does not require as much paperwork and doesn't cost as much as LEED. LEED can cost ten to twenty thousand dollars to do a building. People are starting to wonder what they are getting for it other than the pretty plaques; why not just build to these standards? We know what we need to do to build this way, so why not skip the paperwork and not have the pretty plaque? Green Globes seems to be the up and comer because of cost and paperwork. LEED

can be a bear for paperwork. I know residential ones because I work for Habitat for Humanity. I am the architect for their renovations, and I do an immersive learning class in that. LEED is of course the big gun, but they have also been looking into National Home Builders Association and others.

How do you feel green rating systems have affected you as a designer?
In my LEED class on campus, one of the projects they have to do is to take a smaller project on campus that didn't go for LEED and do what they can to turn it into LEED. They get to look at it from the design aspects. As I said, the best way to do it is by not doing stuff; not tearing down walls, you inventory the doors and see where you can reuse them, check materials.

How do you feel that green rating systems have affected the market?
I think some people feel pressured to do it, and I think it is extremely admirable of Ball State to commit to LEED buildings but I am wondering if they are wishing now that they had made it a little broader based and just said sustainably. Ball State has always been ahead of this, they are always on the list of greenest campuses. I do think some people and firms do feel pressured to build LEED, when I'm not sure the owners always understand. I do think some of the hype is making people want to jump on the bandwagon. I obviously agree to always build sustainably, but I'm not sure mandating LEED is the way it needs to go.

How do you feel green rating systems have affected the building process?
Building sustainably does not necessarily make it more expensive. A lot of what goes into designing sustainably, the way you orient your building, the way the light goes through the windows, doesn't cost any more. The paperwork in preparing LEED, for example, is a lot more. That cost ends up getting passed on, it is not going to be free. Building sustainably does not need to be more expensive, building LEED is.

Do you see a benefit in registering projects with a rating program?
Not anymore. I did in the beginning when it was new. New buildings don't look any different than the LEED ones. In the beginning there was a bang for your buck, but now I don't see that there is. It has become so common. I also believe there is a bit of a backlash coming from architects and construction managers for the amount of money they must spend to do it.

Do you feel green rating systems for projects should be mandated by law or code? Why or why not?
No I don't think they should be simply because of the cost involved in doing them. Building to their standards, I wouldn't mind seeing that. Some building codes are

starting to the put some of the things in, but to say all buildings must be one rating is giving a whole lot of power to one company.

What is your opinion on the criteria on which green ratings systems are based?
I think it is fine, I guess I am just so used to LEED at this point. It was interesting to see them get into areas that I as an architect had never really thought about. Sustainable sites, I hadn't really thought about. They encourage urbanism; they want you to be able to walk to everywhere. They don't like cars; not adding parking lots is good. As an architect I had really thought of it from the indoor quality aspect of it and the reuse side of it. I do think that they have done their homework and really have a very holistic view of it all. A lot of it can be out of the hands of the architect, I mean, you get the site given to you. In my class last semester, the kids do a case study also on a building. One did the Frito Lay plant out in a little town in the middle of nowhere in Indiana. They put bike racks in front of it because they could get points. We all asked, really? Who is biking there? Sometimes it can be not very reasonable. The main focus has been energy reduction, it has the most point, but they have been trying to up the ante on some of the others.

Please explain how you believe rating systems promote or restrain design innovation.
It can probably do a bit of both. If it is in a remodel, it probably would restrain because, as I said, you get more points by not doing stuff. In new buildings, it probably would promote it because you have blank paper. It can be empowering for the architects. You can be constrained by an existing building.

How do you think technology is influencing the field of sustainable design and rating systems?
I think it is doing a great job. A lot of the credits can be done with building modeling. You can build it three-dimensionally to actually see how much daylighting there is. Some of the credits even deal with energy modeling simulations, Ecotect for example.
Technology has just been huge. Revit, certainly, can be a big asset. It can help us look past drawings and see problems down the road. It can be a lot easier to see if a beam is cutting through a duct in a drawing rather than waiting until you are in the building.

Do you see value in multiple rating systems or should there be an industry standard?
There need to be multiple. Any time there is one person in charge of doing something it frightens me a bit. Different ones with emphasize different things. Like ENERGY STAR for homes focuses on the energy aspect of it, where others are going to look at different

areas of it. LEED tries to be a little more across the board. I think a variety of them is what is needed. Different projects are going to have different needs.

Where do you see the future of architecture with respect to green rating systems?
I think it going to keep on going. I may think we don't need to be turning the buildings into LEED, but I seem to be a lone voice. Hopefully the buildings will all continue to be built to the LEED standards, and that this isn't just the flavor of the month type thing. I have a lot of confidence that it will because your generation is very committed to it. I think whether you are going for LEED or whatever rating system it will just become standard procedure.

Jonathan Spodek
AIA, NCARB
Interview conducted Wednesday, February 19, 2014 by Emily Newton and Jaben Temple

What is your history with green rating systems?
I am not certified in anything. I am aware of them. I have explained a couple of them for classes, but just sort of the framework. I have completed projects in the past that are ENERGY STAR rated, but I was not the rater, we contracted that out.

How do you feel green rating systems have affected you as a designer?
I think they have affected everyone as a designer, whether they use them or not; particularly LEED. A lot of that has to do with the fact that it brought up issues and ideas that otherwise wouldn't have been. I think that was really important. It's caused me to learn a lot more about them as I make decisions in my work: should we hire a LEED consultant, should I get certified, etc. I think from an education standpoint, I think it's very important to bring the ideas these rating systems have to our students, so that they have knowledge of what's going on when they get outside of the school.

How do you feel that green rating systems have affected the market?
I think it has completely changed the market from where it was ten or fifteen years ago no doubt whatsoever. The biggest thing that has changed the market is the federal government. When GSA mandated that all of their new buildings be LEED rated, that changed everything. So much work comes out of the federal government, or is funded by the federal government. Likewise, when HUD started mandating that any project funded by their dollars must be ENERGY STAR rated. This changed the way we look at buildings. With the latest version of the International Energy Conservation Code, if you meet its requirements, you meet ENERGY STAR. Those wouldn't have happened without these rating systems.

How do you feel green rating systems have affected the building process?
I do think in the last couple years there has been a division of contractors; those who have engaged in it and those who haven't. I'm not saying the ones who haven't engaged in it aren't good craftspeople or don't build well, but I do think it has increased the knowledge and quality of them. For example, some of the contractors we use here in Delaware County for the housing programs, they had to know what ENERGY STAR was because they were doing HUD work. I talked to Karen and she knows it's all about sealing the house. That would not have happened without these rating systems. The same applies for institutional work. The attention to detail of how things are built is much better because they will be tested. There will be someone doing a blower door test,

someone evaluating the duct system. They can't just get by with putting it up. There is a back check, which I think has been very positive. In this sense, I think it has changed how things are built.

Do you see a benefit in registering projects with a rating program?
That's a hard one. I do and I don't. I do because it forces people to have accountability. Both clients, contractors, designers, design/build firms, there is an accountability there that is important. I think it is good marketing to be able to say as a community that we value this. Chicago has said that any building being built must be rated or benchmarked. Getting people on board is important.
On the flip side of this, I have talked to people at Habitat for example. They build their houses to LEED standards but they don't get them certified. It's because they don't want to spend the extra money to get that done. They are more concerned for internal purposes that they are doing it well. They also are trying to do this with a limited budget. At Eco Rehab we run into the same problem. Do I spend an extra $500 for the ENERGY STAR light fixtures, or do I buy a normal fixture and put CFL bulbs in it and get the same performance and then be able to spend that $500 somewhere else where it can be more effective. This changes if you are applying for grants. Then you must use ENERGY STAR fixtures and things that may cost more. It's a balance, but I think overall it is a good thing and there is some worth to it. I think it is naive of people who say LEED is awful and is just a point system; I guess if you are a cup half empty person then it is. It also has some good qualities to it that have changed the marketplace.

Do you feel green rating systems for projects should be mandated by law or code? Why or why not?
I think they already are to some extents. There are a lot of funding agencies that mandate them. There are some in ordinance; the city of Boulder has it for rehab you have to meet their rating system. I think what's happening is it is happening informally through the adoption of more stringent building codes. I don't know if I really have an opinion on it though.

What is your opinion on the criteria on which green ratings systems are based?
I think each one is different. You are talking apples to oranges to shoes. The most popular ones I think have some green bling in them; I get points for putting a bike rack on. Some of them are a little more performance based. For example, the ENERGY STAR is a little more performance based through the HERS rating system. There has not been a good one come out yet that deals with existing or renovating buildings. That is a really hard one. Each of them has their own problems.

Please explain how you believe rating systems promote or restrain design innovation.

I don't think they have any effect on design innovation. People who say they can't be creative because of a rating system probably couldn't be creative without a rating system either. For each one there have been some beautiful projects come out of them. People say this same thing about building codes.

How do you think technology is influencing the field of sustainable design and rating systems?

I don't know about rating systems. I think there are two camps in this environmental sustainability movement in construction. There are the passive people and there are the technology people. I think it is going to probably take a balance of both. I think we have to be careful about relying too much on technology to meet our design goals or energy consumption goals or environmental goals. I think you need the technology, but you need the good design, the good construction, and knowing the building science first.

Do you see value in multiple rating systems or should there be an industry standard?

Each of the rating systems addresses different issues. It would be hard to do one giant one. Some are more performance based, some are more material based. We used to have multiple building codes. The International Building Code came out in the early 2000s. It was very locality specific before. We all seemed to manage. I bring this up because the code is very performance based. There are some hard lines, but for the most part how you achieve levels of performance is up to you. If we do go to one, it would have to be performance based to give flexibility. Location is so unique when it comes to rating systems. For example, if I am building in a town without public transportation it will be very hard to get some of the LEED points versus building in a dense urban core. The energy question in different parts of the country is different as well. When you are in the Southwest you are going to have a larger capacity for solar energy production, whereas if you are in a tight urban area you are limited.

Where do you see the future of architecture with respect to green rating systems?

I think they are just going to get more and more mandated. I think USGBC has the market on most of it. I know people complain a lot about them, but I think they have done a lot of good; more good things than frustrating things. At least for the next 30-50 years, until things get to the point where the construction industry has really shifted in terms of energy consumption, production of materials, carbon footprint, how we deal with our cities, they are going to be there. There are still some challenges, but they will still be around.

James R. (Rod) Underwood
Interview conducted Thursday, February 20, 2014 by Emily Newton and Jaben Temple

What is your history with green rating systems?
I don't have a history of working with them.

How do you feel green rating systems have affected you as a designer?
I don't think they have. We had a lecturer here who made a presentation on LEED two or three years ago, and probably because of my own bias, I really identified with. He said that he hated LEED because it was sort of the suggestion that LEED was sustainable design and it was good design. He thought any sustainable design was good design and it had nothing to do with LEED whatsoever. He said that we should be doing that all the time. We should be looking at issues like daylighting and natural ventilation and site usage and addressing the context of all those things we talk about in studio.

How do you feel that green rating systems have affected the market?
I think they've probably had a significant effect. Products have been created that are recycling materials, and new products have been created that are using different kinds of materials we have not historically used. I think the fact that there's even discussion about it makes everyone more conscious of the fact that they ought to be considering energy use and recycling and more efficient buildings and places.

How do you feel green rating systems have affected the building process?
In some cases again, significantly. Because some owners are really looking for LEED certification on a platinum building, and so that influences the design process and construction process almost from the beginning.

Do you see a benefit in registering projects with a rating program?
That's my ignorance. I don't know if there really is or not. If they have tax incentive programs I think it would be a good idea. I don't know if they do or not. [Newton: "Some of them do."] Well then I think that's a great idea.

Do you feel green rating systems for projects should be mandated by law or code? Why or why not?
I think we should be forced to create more sustainable designs. And if it's through mandating green rating systems or some other way, I think it could be done simply through energy usage.

What is your opinion on the criteria on which green ratings systems are based?

I'm not really qualified to answer that.

Please explain how you believe rating systems promote or restrain design innovation.
I think they promote it simply because you're forced to solve new problems, and that means new solutions. There was a time that nobody cared what was generated on site in terms of waste, and nobody cared about where the storm water went. Now they care because there's some financial impact. You know, I'd like to believe that we're all borderline saints doing this out of the goodness of our hearts but the only way it's ever going to become effective is if there's some type of financial reward or punishment for not addressing it.

How do you think technology is influencing the field of sustainable design and rating systems?
I don't know how it's influencing rating systems. From my own personal point of view, I think in some respects technology is sort of working against it. It's the old story of we can take a skyscraper, make it all in glass, and in winter we heat one side and cool the other. I mean, technology allows us to do this. If we looked at sustainable practices – ways of doing this without technology – with passive solar heating is one. Daylighting is one. Those don't require technology to make them work. They're just good, common sense solutions. So I don't think technology is what's going to necessarily solve our problem for us in terms of sustainable issues.

Do you see value in multiple rating systems or should there be an industry standard?
I think if there was one tremendous one it would be wonderful but there isn't. I guess there's value in testing. It is alternative solutions, like studio. I think there's value in that.

Where do you see the future of architecture with respect to green rating systems?
I don't know if it really has anything to do with the rating systems, but I think we have to address our environment in a more responsible way. If the rating systems are the way that force us into doing that, okay. To hide our heads and say that we don't have global warming is ridiculous. So what do we do about it? To think that we're not going to run out of oil some day is ridiculous. So what are we going to do about it? Are we going to wait until it happens then try to solve the problem? A lot of politicians and people talk about how our technology will save us. Maybe. Or maybe technology's what's gotten us into this position in the first place. I'm not so sure that's going to happen. I'm concerned we're going to get to a tipping point where we can't fix it. When that happens, I'm not

sure that we don't become dinosaurs. To ignore it is just really stupid, I think. To suggest that it's not happening is really stupid.

Robert Koester
AIA, LEED-AP, Director of Center for Energy Research/Education/Service
Interview conducted Friday, February 21, 2014 by Jaben Temple

What is your history with green rating systems?
I became an accredited LEED professional several years back and then used that to provide consulting to practitioners and the university. When the David Letterman building was being designed we did some of the preliminary LEED analysis on it. We worked with some of the school corporations in the state and did some LEED analysis for them. So we mostly serve as a consulting research function.

How do you feel green rating systems have affected you as a designer?
It has helped to organize my thinking about the complexity of performance evaluation. I have found it helpful to differentiate green materiality from the sustainability of flow from the export of resources, and the generative potential of buildings. By thinking in those scales, or those three levels of intervention, it is possible to be more organized as a designer. Choosing materials because they are locally sourced, because they are recycled, recycled content, can be disassembled, can be repurposed, that is one set of questions that plays into the palette of material choice. Secondly, you have what are the flows through the building: What is the energy striking the building from the sun? What is the demand in kbtu's per square foot per year of heating and cooling? What's the electrical load, how many watts per square foot? How do I control that through lighting design or efficiency of equipment choice? Finally, is there any way the building can give something back. Could it export electrical power? Could it export water resources? Could it export even food when you consider the land that it sits on?

How do you feel that green rating systems have affected the market?
Well certainly LEED has had an enormous effect. LEED especially was a market driven approach. The realization of the founders of the USGBC was that unless this came into the market system and we had some sort of rating system, that there was no way we were going to transition to better buildings. So the market is the tool. A lot of folks are critical of LEED, that it is just a checklist or that you just gather points, and the points are sort of inconsistent. In the early versions of LEED you could get one point for a bike rack or you could get one point for a certain number of btu reductions, so that is a sort of odd thing but that is just a product of putting a rating system together using a consensus process. It is an imperfect system, but it has gotten better and better. What I like about it is that it provokes conversation. It means that from day one the client, the contractor, the sub-contractors, the consultants, the designers are all discussing these questions.

How do you feel green rating systems have affected the building process?
The biggest thing is they cause is more focus on integrated design and integrated project delivery. In both cases you get all the players to the table on day one. It is causing folks to become more team players. It is a healthier process.

Do you see a benefit in registering projects with a rating program?
One of the things that unfortunately happens in the market is to some administrators who are overseeing a project, the client will say well I just want LEED equivalent, I don't want a LEED rating. What they think is that they are going to save money but not paying the upfront cost for registration, but buildings are such complex artifacts and the process in which they get designed, constructed, and used area such complex bunch of processes that it is a fool's game to try and get equivalency and not actually do the rating. The kinds of things that can happen when you secure a rating is that you have to prove chain of custody of materials, you have to prove that the materials meet the criteria, you have to prove that the building performance is what it is supposed to be. Often times during the commission process, which is mandated in LEED, you discover things that were installed incorrectly or things that got overlooked. It can be fluky small stuff but it can add up. It is these sorts of things you discover in commissioning because you actually turn systems on, monitor their performance, and sometimes you will find pumps that were put in backwards, devices that don't meet the specs when the manufacturer said they would.

Do you feel green rating systems for projects should be mandated by law or code? Why or why not?
It wouldn't hurt to have them integrated into law. It would force folks to do it, so it would capture that part of the market that is not yet responding, so that would be worthwhile. There would be a lot of pushback, and some of that pushback might cause compromise. One of the things that happens with basic building codes is that model code organizations that develop the code language, and then they publish those. Those too are done by consensus. Then a state or municipality adopts that code. What has happened in Indiana over many cycles, is that the state will adopt that code but with caveats. They water it down or screw around with it. That could happen with LEED, BREEAM, Green Globes, or any of them if they became the mandated requirement. The other thing that would happen would is you would get pushback because the Green Globes folks would say why not use our system it is as good as LEED, or BREEAM would come over and say well we have this great system over in England why not use it in America. So you get this competitive thing going and then you get the famous phrase *or equal*, which is not always equal. So it would be thorny. It wouldn't be a bad thing to mandate that something be used, and leave it open for people to pick. This might

incentivize the market or incentivize participation because folks would have some freedom of choice. I think mandating it in that way would be positive.

What is your opinion on the criteria on which green ratings systems are based?
Could always be stronger. I think Architecture 2030 is a good example of a stringent set of criteria. 2030 is quite specific; it says we are going to energy neutrality. Not just making things a little less bad, but we are going to eliminate net energy use. So that is a pretty nice standard. The AIA has adopted it and endorsed it, quite a few big architectural firms have adopted it and endorsed it, some municipalities have. Again, so a voluntary thing where folks have stepped up and said we are going to hit this standard. So I think that is a good benchmark.

Please explain how you believe rating systems promote or restrain design innovation.
They promote innovation because they cause manufacturers to reexamine their products. You look at a company like Interface Flooring and they totally revamped how they produce carpet tiles. They are one of the most green manufacturers in carpet technology in the world. They have dialed down their pollution, they have dialed down their toxic material, they have dialed everything down. Their factories run efficiently. They are just really good at capturing the waste stream and figuring out how to bring it back into use. What is interesting in their case, and it is true for most manufacturers is that they are discovering it is a profit opportunity. They can actually make more money if they have less waste and pollution. For them it has been a really good thing. Their profitability and success is based on the fact that they reexamined their product. The degree in which the rating systems cause companies to do that is really positive. Overall it has been a good move.

How do you think technology is influencing the field of sustainable design and rating systems?
There is a bit of an embedded belief or we take on faith that technology is a salvation all of the time, and it is not always the case. To some degree technology becomes a whipping boy for not thinking about or not figuring out a higher quality design. That is the basis of the modern movement in architecture. We don't need to worry about climate, we can have a totally glass building with one layer of glass because we have enough energy to burn up what we need. In that case technology became a diversion or an escape for the real complexities of how buildings perform. So sometimes technology is the whipping boy for lack of decision making or very narrow minded attitudes about what architecture is really about. In other attitudes, technology is leading the charge. We've got some pretty remarkable stuff with lighting. You've got LEDs, and pretty soon we are going to have organic LEDs that use hardly any energy and produce really high

quality illumination. That's been about a twenty-five or thirty year development, and so the researchers and manufacturers that have pushed technology to a point where it is a really beneficial thing now; using lighting as not an energy and waste heat problem. We have a lot of folks interested in playing around with technology where you can mimic nature. You can grow sheet good material that can be used for upholstery. You can grow it from scratch and use certain enzymes and other components so that this stuff happened in a petri dish and before long you have a manufactured skin if you will. A lot of that kind of frontier work is going on which is a good thing. Eventually it can come back into the market and have some sort of impact.

Do you see value in multiple rating systems or should there be an industry standard?
I think the multiple systems is not so much a problem. I think it is okay. I think the fact that they all don't use the same framework is not necessarily a bad thing. I'm not so bothered by it. I don't think one system is necessary.

Where do you see the future of architecture with respect to green rating systems?
In an ideal world we wouldn't need the rating system anymore because everyone would be doing the right thing. I think though rating systems will be around forever. I think they will transform, get more sophisticated, will get used in more creative ways, will cause more creative intervention on the part of designers. I think they are here to stay.

Appendix B

Green Rating for International Habitat Assessment

The Green Rating for Integrated Habitat Assessment is a rating system developed and used in India. GRIHA is a rating tool that helps people assesses the performance of their building against certain nationally acceptable benchmarks. It evaluates the environmental performance of a building holistically over its entire life cycle, thereby providing a definitive standard for what constitutes a 'green building'. The rating system, based on accepted energy and environmental principles, will seek to strike a balance between the established practices and emerging concepts, both national and international.

Appendix C

Living Building Challenge
Red List

The project cannot contain any of the following Red List materials or chemicals.

- Asbestos
- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated Polyethlene
- Chlorofluorocarbons (CFCs)
- Chloroprene (Neoprene)
- Formaldehyde (added)
- Halogenated Flame Retardants
- Hydrochlorofluorocarbons (HCFCs)
- Lead (added)
- Mercury
- Petrochemical Fertilizers and Pesticides
- Phthalates
- Polyvinyl Chloride (PVC)
- Wood treatments containing Creosote, Arsenic or Pentachlorophenol

There are temporary exceptions for numerous Red List items due to current limitations in the materials economy. Refer to the Dialogue for complete and up-to-date listings.

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